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ABSTRACT

The development of apprenticeship programs in several Latin American countries was investigated with a focus on the results of an industrial apprenticeship program in Santiago, Chile. The program studied was the Instituto Nacional de Capacitacion Profesional (INACAP), the national vocational training institute of Chile. The purpose of the study was to determine whether the INACAP's industrial apprenticeship program offered a plausible nonformal educational alternative to Chile's industrial-technical schools. The clientele of the INACAP program were from the more disadvantaged groups of the population, had rarely continued their schooling beyond the compulsory level, and entered the program to learn a trade more quickly than in vocational schools. Only about one-half of the graduates were working in their trained-for trades; nearly one quarter were unemployed. Most of the INACAP graduates had a higher or similar level of job performance as compared to their coworkers. Their higher earnings were not due to higher socioeconomic backgrounds. Although the apprenticeship program yielded higher rates of return than the industrial vocational school programs, a study of costs of both systems showed that the yearly investment per student was slightly higher in the apprenticeship program. (Some policy implications are discussed.) (YLB)

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Apprenticeship in Latin America: The INACAP Program in Chile. A Case Study

Oscar E. Corvalán-Vásquez

Centro de Investigacion y Desarrollo de la Educacion

Santiago, Chile

1981

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This paper is based on the author's unpublished dissertation, "Comparative Study of Industrial Training," completed for the Department of Educational Theory and submitted for the degree of Doctor of Philosophy at the University of Toronto, Canada, in 1979. Apart from the guidance and counsel received at the University of Toronto in completing his degree, the author wishes to mention the following institutions that cooperated in the study: INACAP, SENCE, CINTERFOR, and the Chilean Institute for Personnel Management (IAP). He also expresses his appreciation to his colleagues from the Department of Educational Planning of the Ontario Institute for Studies in Education in Canada, and the Center for Education Research and Development (CIDE) in Chile. The study was carried out in 1977-78 while the author received sponsorship from the Ford Foundation.

FOREWORD

Through its series of Occasional Papers, the NFE Information Center seeks to provide a forum for the exchange of ideas among those pioneering in the study and practice of non-formal education. In dynamic, relatively new fields of inquiry and experimentation it is especially important to bring "ideas in progress" to the light of collegial scrutiny. We intend the papers in this series to provoke critical discussion and to contribute to the growth of knowledge about non-formal education.

In this monograph, Oscar Corvalán-Vásquez gives an overview of vocational industrial apprenticeship programs in Latin America, and specifically analyzes the results of one out-of-school program in Chile. The rather positive outcomes of this case are described and also subjected to cautionary critique. Educational planners, in particular, should find this paper of keen interest as they consider the comparative functionality of apprenticeship systems and vocational school systems for the preparation of young skilled workers.

We are grateful to Oscar Corvalán-Vásquez for sharing his work with us and inviting us to bring it to the attention of development planners in the Non-Formal Education Network. We also acknowledge the careful editorial attention given his manuscript by Earl K. Brigham in preparing it for publication.

As always, we invite your comments and contributions to enrich the dialogue concerning critical issues in non-formal education.

Joan M. Claffey

Director

Non-Formal Education Information Center

ABOUT THE AUTHOR

Oscar Corvalán-Vásquez is presently working as a Research Coordinator at the Center for Educational Research and Development (CIDE) in Santiago de Chile. During 1979-80 he conducted an evaluative study of the apprenticeship programs carried out in Brazil, Colombia, Costa Rica, Chile, Ecuador, Peru and Venezuela, as a consultant to the Interamerican Research and Documentation Centre (CINTERFOR). From 1976 to 1978, he was a lecturer in Sociology at Laurentian University of Sudbury, in Ontario, Canada, while also working as an associate researcher with the International Council for Adult Education (ICAE). The University of British Columbia has published his study entitled, Vocational Training in Latin America: A Comparative Perspective, and he has collaborated with others on the two-volume work, Adult Education in Latin America, published by the ICAE.

The author has received training in Sociology, Economics and Education in Chile, Switzerland and Canada, and at present is conducting research in the field of vocational education and the Informal Sector of the Latin American economies. He has also served as a consultant to the International Labour Organization, the Organization of American States, and the Inter-American Development Bank in the field of technical education.

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GLOSSARY

In Latin America and the Caribbean area, the following institutions and programs are commonly referred to by their initials or abbreviations.

CINTERFOR -- Centro Interamericano de Investigacion y Documentacion sobre Formacion Profesional (the Inter-American Research and Documentation Centre on Vocational Training), an I.L.O. agency, located in Montevideo, Uruguay.

I.L.O. -- The International Labour Office and the International Labour Organization, headquartered in Geneva, Switzerland.

INA (Costa Rica) -- Instituto Nacional de Aprendizaje (National Training Institute).

INA (Nicaragua) -- Instituto Nacional de Aprendizaje (National Training Institute).

INACAP (Chile) -- Instituto Nacional de Capacitacion Profesional (National Institute for Vocational Training).

INFOP (Honduras) -- Instituto Nacional de Formacion Profesional (National Vocational Training Institute).

INTECAP (Guatemala) -- Instituto Tecnico de Capacitacion y Productividad (Technical Institute for Vocational Training and Productivity).

ODEPLAN (Chile) -- Oficina Nacional de Planificacion (National Office for Planning).

SECAP (Eduador) -- Servicio Ecuatoriano de Capacitacion Profesional (Ecuadorian Vocational Training Service).

SENA (Colombia) -- Servicio Nacional de Aprendizaje (National Training Service).

SENAI (Brazil) -- Servicio Nacional de Aprendizagem Industrial (National Training Service for Industrial Apprenticeship)

SENAC (Brazil) -- Servicio Nacional de Aprendizagem Comercial (National Training Service for Commercial Apprenticeship).

SENATI (Peru) -- Servicio Nacional de Adiestramiento de Industria y Torismo (National Service for Training in Industry and Tourism).

SENCE (Chile) -- Servicio Nacional de Capacitacion y Empleo (National Service for Vocational Training and Employment).

SNPP (Paraguay) -- Servicio Nacional de Promocion Profesional (National Service for Occupational Promotion).

APPRENTICESHIP IN LATIN AMERICA: THE INACAP PROGRAM IN CHILE. A CASE STUDY

Oscar E. Corvalán-Vásquez

I. INTRODUCTION

This investigation provides, firstly, an account of the development of apprenticeship programs in several Latin American countries. Secondly, it focuses on the results of an industrial apprenticeship program in Santiago, Chile: the INACAP Program.[1]

The questions for which the empirical study seeks to provide some answers relate to the capacity of the Chilean apprenticeship program to partially substitute for vocational technical schools and still achieve similar results. Specifically, it is intended to evaluate results achieved by the National Vocational Training Institute (INACAP) as compared to those yielded by training provided within the vocational schools of the country for a set of industrial occupations. The purpose is to assess to what extent one or the other model of training offers better employment opportunities to its graduates.

In addition, the study investigates whether income differentials exist in the earnings of individuals in similar industries who are more or less the same age and have similar professional experience, but differ in the education and or training they have received. Where such differentials are found, the study attempts to explain them. To achieve this,

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[1] INACAP = Instituto Nacional de Capacitacion Profesional, the National Vocational Training Institute of Chile. Since May 1, 1976 the INACAP program is administered by a specialized department of the Ministry of Labour, the National Service or Vocational Training and Employment, "SENCE."

the various paths followed by a sample of industrial workers in Santiago in reaching their present occupations are examined.

1.1. Some Background Information on Apprenticeship Programs in Latin America

In the present study, it is argued that the creation and expansion of several training systems now in operation in Latin America have been the result of a conscious international strategy for transferring a European model of training to Latin America: the apprenticeship system. In effect, the International Labour Organization (I.L.O.) since the 1950's has been advocating such a model of training for adolescents and a vocational training model for adults. To that end, a specialized agency of I.L.O. called "CINTERFOR"[2] was created in Montevideo, Uruguay, during the 1960's, with the main goal of promoting the creation and consolidation of national training institutes in each country of the region. Moreover, many of the older training institutes of the region began devoting most of their efforts to apprenticeship programs for minors. This was particularly the case in Brazil, Colombia, and Venezuela.

In 1975 CINTERFOR sponsored an investigation concerning the prospective development of the different programs offered by the national training institutions of Latin America and the Caribbean.

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[2] CINTERFOR is the Inter-American Research and Documentation Center on Vocational Training.

It was established that out of nineteen institutions surveyed, only eight had minor's apprenticeship schemes underway, and that another three, more recently established, expected to implement them in the near future (CINTERFOR, 1975). All institutions were asked by CINTERFOR to show total volume of apprenticeship training within total enrollment, as measured by two indicators: (a) the number of apprentices, and (b) the number of teaching hours. They were also consulted regarding the percentage of apprenticeship time spent at training centers and in plants. And, finally, they were asked to indicate the percentage of apprentices under contract. The results show that, although in some institutions apprenticeship accounts for a small fraction of the total number of participants, the effort involved in such schemes is considerable when measured by the number of teaching hours that it absorbs within the total schedule. In the case of SENA-COLOMBIA, for instance, the apprentices, who represent only 8.6% of total enrollment, take up 46.3% of the total teaching time; at the Costa Rican INA, where 10.6% of those enrolled are apprentices, the figure amounts to 55.6%; and, at the Peruvian SENATI, with only 4.7% apprentices, the figure is an even higher 67%.[3]

---

[3]National institutions and programs for training throughout the region are commonly referred to by abbreviated titles or initials. Official titles for those so mentioned in this paper can be found in the GLOSSARY on page x.

Most apprentices spend more than 50% of their time at training centers; in some cases, the proportion is 100%. The projected tendency in the majority of the institutions seems to be to increase the time spent by apprentices in plants.

With regard to the number of apprentices under contract, it was found that only in two vocational training institutions are all apprentices under contract to firms. Moreover, the number of apprentices enrolled in all institutions is very small compared to their overall program. The Colombian SENA stated that, according to the country's law, all apprentices must have contracts. However, a survey prepared by Jeffrey Puryear (1975) concerning the recruitment to industrial apprenticeship in those training centers shows that this requirement is often ignored, and that applicants are accepted on the understanding that SENA will seek a suitable sponsor for them. In fact, out of the group of apprentices surveyed, 77% enrolled without prior industrial sponsorship, while SENA obtained contracts for 71% of those without prior sponsorship. As a matter of fact, in Colombia firms tend more to accept apprentices directly than to send them to SENA for vocational training.

The problem with such a policy is that some entering students may not, in fact, have a prior commitment to a particular occupation. Their decision to enter SENA is due as much to a lack of reasonable alternatives as to their desire to undergo specific occupational training. In such

circumstances, almost any educational option may be better than nothing. Also, the relatively large proportion entering without promise of sponsorship suggests that firms are not directly seeking out such training by sending applicants to SENA. They sponsor apprentices for training whom they have no intention of hiring upon graduation. Probably this is an important factor, as less than one-half of the graduates stay with their sponsoring employer upon graduation, despite having spent half of their training time for that employer.

In examining the apprenticeship programs in Latin America, a surprising fact emerges. Despite the apparent failure of transferring this training model to Latin America as a method of preparing most of the skilled manpower entering the labor force, the model is still being implemented, though on a very reduced scale, in some countries of the region. Among the more recently created institutions that were surveyed, SECAP from Ecuador, SNPP of Paraguay, and the Guatemalan INTECAP reported that they were initiating minor's apprenticeship programs. In addition, the Nicaraguan INA had set up an apprenticeship program before the revolution transformed the overall educational system of the country, and the INFOP of Honduras had launched such a program by the mid-1970's.

The previously mentioned situation is not confined to the relatively smaller countries of the region. In effect, both SENAC and SENAI from Brazil (the biggest vocational training institutions of Latin America) have reported to CINTERFOR that they find the high proportion of apprentices without work contracts to be a very serious problem, for which

they see no easy solution in the immediate future. This is particularly so when it is realized that unemployment among the young labor force is very high in Brazil, as it is in most Latin American countries, affecting more and more people with some education.

The following offers a brief resume of the apprenticeship programs in those Latin American countries which have adopted them. While this has taken place relatively recently in most of the countries, Brazil's program has been in use for about forty years. In this respect, it can be argued that most of the programs have been in operation for too short a period of time to evaluate their real impact in the region. Nonetheless, there seems to be enough evidence to assess the major causes of the model's failings and or success. Before assessing those factors, a brief general panorama of the situation in some countries will be given. (All data are from CINTERFOR, 1975, Vol. II.)

In Chile, the National Training Institute (INACAP) introduced an apprenticeship program in December 1967. Apprentices initially spent 32.1% of their training time at training centers and the remaining 67.9% in plants and enterprises. At present, they spend 50% of their time at the centers and 50% in plants. A half of the time spent at training centers is used in laboratory and workshop work and the other half in the classroom, for practical and theoretical training, respectively. Therefore, income forgone is only related to 50% of the apprentices' total training time of 36 months. Nonetheless, INACAP expects to be able to revert to the original proportion in the future. It is mainly because of the reduced number of apprentices that this institute has

been able to get contracts for them from different enterprises. In effect, they account for only about 2% of the total number of trainees INACAP looks after, and so far, it has an apprenticeship program only for the industrial sector.

As has already been mentioned, the situation is somewhat different in Colombia. Since SENA's growth is to be mainly aimed at the training of unemployed and underemployed persons, through accelerated courses, and at the improvement of managerial levels, minor's apprenticeship was to diminish from 10.9% to 7.1% within the total action of the Institute during the period 1975-1980. SENA itself has pointed out that the large number of apprentices without a contract was due to transgression of the Colombian Apprenticeship Act by some firms.

The apprenticeship program of SECAP (Ecuadorian Training Service) started in October 1973 with only a pilot course. The actual demand for training courses, as measured by the number of applicants at the beginning of each course, exceeds by far the resources available to the institute. The demand is, in fact, practically 100% greater than the institution's capacity in vocational training. So, SECAP has planned to expand apprenticeship schemes during the period 1975-1980 by raising their share to 12% of the total training offered by the institute.

The Brazilian SENAI was the first vocational training institution of Latin America to organize, in 1942, an industrial apprenticeship program to serve the manpower needs of the manufacturing sector. While

there were some previous attempts of this nature by a Brazilian Railways Enterprise, it was only after 1942 that the development of structured non-school programs began to achieve more or less national coverage in Brazil. Also, the creation of SENAI by the National Employers Federation marked the beginning of the development of modern training institutes in Latin America. After the creation of SENAI, several Latin American countries established a national training institute and created an apprenticeship program. There is a major difference, however, between the Brazilian model of apprenticeship and the systems organized in other Latin American countries. In Brazil (as in most western industrialized countries), apprenticeship is sponsored and organized by the employers; in most countries of Latin America these programs are run by governmental agencies.

In Latin America, most of the national training institutes are dependent on ministries of labor or economics. This is an important feature that influences the objectives, availability of training, teaching methods, financing, and organization of these programs (Corvalán-Vásquez, 1977).

The implementation of apprenticeship systmes in Latin America has been justified from at least two standpoints. From an economic perspective, it has been justified in terms of the need to prepare qualified manpower to support the industrialization process of the region. From a social standpoint, it has been called upon to deal with the promotion of young people from the lower socio-economic strata by providing the kind of training which would allow them to have a productive employment,

thus ensuring a better income for them. However, several factors have contributed to the stagnation of the development of apprenticeship systems in Latin America.

First of all, most of the employers are not ready to run and finance apprenticeship programs. They may even accept the need to finance these programs through a tax, but they are not ready to receive apprentices for practice in their firms, and to hire them at the end of the training period. As a matter of fact, this problem is related to the historical incapacity of the manufacturing sector to provide employment for a greater proportion of the number of people.

Secondly, there has been little interest in developing apprenticeship schemes on the part of the labor unions and also on the part of the students themselves, who seem to prefer the path available (for a few of them) within the formal system of education.

Thirdly, there are several problems involved in implementing an apprenticeship program which are related to poor coordination between the training institutes and the enterprises, poor manpower forecasting, and the inadequacy of the curriculum to meet the requirements of the labor market for each occupation.

Finally, it has been pointed out that apprenticeship stagnation has been due to its high cost when compared to other forms of training, lack of preparation of the teaching staff, resistance of the entrepreneurs, and inapplicability of the work contract (CINTERFOR, 1978).

On a macro level, it could be said that apprenticeship has failed in Latin America because of the historical development of the region. For instance, historically, in Latin America a progressive bourgeoisie never developed, which would have been able to promote national development in a rather autonomous way. Also, because of the particular conditions under which the actual labor force of these countries grew and became organized, a modern proletarian movement exists only in a few countries and is confined to the modern sector. It seems that for an apprenticeship scheme conceived under the European model to function, the society needs to include both a progressive bourgeoisie and a modern proletarian movement.

The major differences between the original European model and what is known as apprenticeship in Latin America can be summarized as follows:

1. The practice that all apprentices be under a work contract with an entrepreneur has been almost impossible to fulfill in that region. The result has often been that the employers are not willing to keep employing the apprentices at the end of their training.
2. The apprenticeship courses in Germany and other European countries generally take place in the workshop of a plant organized by the enterprise, according to the system of production which is being utilized. In Latin America, this rarely happens. The apprenticeship courses take place in the training institutes, and the students are sent to enterprises for practical work during a short training period within the program.

3. The proportions of theoretical training at centers and practical training in plants are also different. In the European tradition, the students are free from work in the plant once a week to attend vocational schools. In Latin America most of the training program takes place at a training center, which offers both theoretical and practical training.
4. The cost and other resources spent for training apprentices in Latin America are not supported by the employers themselves, but by taxes on the payroll, on wages and salaries, or indirectly by the State.

In summary, the development of apprenticeship programs in a few Latin American countries has failed to provide training opportunities for the majority of young people who — mostly for socio-economic reasons— do not have any educational or training opportunity at the end of their primary education. The impressive population growth of the region, and the low rate of employment generation in the modern sector, has produced a considerably large number of young people who are marginal to the economic as well as to the educational systems.

What follows in the next pages is an account of research carried out to evaluate the degree of success of one small apprenticeship program. While it may not have a considerable impact in terms of the number of people thereby benefited, the effect of such a program on the lives of those who had the opportunity to follow it should be examined.

1.2. Study's Context, Purpose, and Main Issues

During the 1960's an equilibrium between the production of graduates and this absorption by the labor market was seen not only as desirable, but also as quite possible. In those years, manpower planners were concerned that important "bottlenecks" in economic growth would occur in non-industrialized countries, owing to their lack of qualified manpower.

As a result of manpower policies then adopted, many Latin American countries expanded their educational systems and the average level of schooling in the labor force increased in a considerable proportion.

However, during the 1970's, non-industrialized countries were facing persistent unemployment. The average level of schooling in the unemployed labor force increased, and the presently high unemployment rates show no sign of diminishing in most Latin American countries.

It must be realized that the problem of employment and unemployment is a function of overall strategies for economic development, and is a function of the option chosen by the political elite of each country. Also, changing development strategies from highly capital- and technology-intensive modes to more labor-intensive approaches is bound to run counter to the investment protection and speculative concerns of national corporate interests.

As a matter of fact, changes in the educational system probably have not influenced to a great extent the described unemployment situation. But the opposite relationship is much more obvious. That is to say, with high unemployment rates, the majority of the labor force tries to maximize

the chances of getting a higher paying job by continuing their education as long as they can support themselves. In such a situation, the low income thus forgone is an additional incentive to continue studying. This seems to have occurred in most Latin American countries, and in Chile in particular the expansion of educational opportunities has been accompanied by relatively high rates of unemployment among young people. After sizeable expansion at the primary level of education, there followed an enormous expansion at the secondary level, and within the latter level an important expansion of vocational schools.

However, before more resources are channeled into vocational schools, some basic questions need to be answered. Two such questions concern: (1) whether "schools" represent the most efficient type of training; and (2) how the costs involved compare with other training methods, such as apprenticeship programs, on-the-job training, non-formal education programs, etc. Of course, each method may offer certain advantages and disadvantages, depending on the quality and job-relatedness of the training provided, the structure of the labor market, and the cost associated with each type of training. Therefore, it could be argued that there is no universal answer to these questions, and the suitability of one method of training or the other depends on the specific characteristics of a particular society, its educational systems, and the characteristics of the target population.

Thus assuming that there are various methods and institutional settings in which to train a group of people to perform a given occupation, research and planning should provide the information necessary

to determine under which conditions one method is more suitable and profitable than another.

The present study focuses on the impact of two models of training in Chile -- the apprenticeship model and the vocational school model. Essentially, an attempt is made to estimate the potential contribution made by these two different types of education to income differentials among a sample of industrial workers of Santiago. For example, the study investigates whether one could substitute an out-of-school program (apprenticeship) for formal schooling (after compulsory elementary education) and still achieve similar economic results in terms of income.

Most studies done in non-industrialized countries, in which the cost effectiveness of vocational and academic secondary schools are compared, indicate the former to be less profitable to society because of their higher costs (Zymelman, 1971). However, this could be the result either of inefficient operation, or the fact that there is little demand in the labor market for the kind of training these schools provide. Or there may even exist a situation of generalized unemployability. In addition, if the poorer children go to vocational school and the wealthier to academic school, then it might be expected that the former will have much more difficulty in finding a job, regardless of the specific organization of the training program. That is to say, a different mode of training would not alter the result. If, however, what vocational school graduates lack is job experience, then a model of training which partially provides such experience might be better than vocational schools.

1.3. Specific Objectives of the Study

The main purpose of the present study is to determine whether the INACAP's industrial apprenticeship program might offer a plausible educational alternative to the industrial-technical schools in Chile in providing a terminal training program to students who have completed grade 8. By "plausible alternative" is meant an alternative to formal schooling, which would provide a similar kind of training at lower cost, and eventually generate better rates of return for individuals and society.

This study will not only apply a cost-effectiveness approach to the INACAP's apprenticeship program, but it also seeks to find out the problems and consequences of applying a non-formal education strategy to vocational training in general, and the problems and consequences of a relatively large expansion of the apprenticeship program in Chile.

On the basis of the previous discussion, the following are specific objectives of the present study:

1. The study attempts to estimate statistically the potential contribution which differing types of education make to income differences among a sample of employees and workers of the industrial sector in Santiago.
2. A second objective is to evaluate how well the INACAP's trainee performs in the labor market and in the work environment when compared to graduates of industrial-technical schools working in similar occupations.

3. Since courses taken at INACAP give credits for further educational purposes in the formal educational system, a third objective is to investigate whether the students regard the apprenticeship program as a terminal program, or if they normally continue studying in the formal system after graduation.
4. Given the high rates of unemployment in the age group 15-19, the opportunity costs for students are relatively low and, therefore, it is assumed that students try to take advantage of any educational opportunity available in society. The apprenticeship program appears to be an educational alternative which is small enough to attract the interest of many students, although admitting only the most qualified. So, a fourth objective is to determine what kind of student is likely to be selected for the program.
5. In addition, the study shows the career patterns of apprentices who finished the program between 1970 and 1977, and their impact on the labor market, which is particularly important for the purpose of planning a possible expansion of this type of program.
6. Finally, the study allows an examination of the different paths followed by a sample of industrial workers having similar occupations, in terms of the several combinations of education, training, and job experience they may have followed in reaching their present status.

II. METHODOLOGY OF THE STUDY AND THEORETICAL FRAMEWORK

First of all, it is necessary to point out that the present research report is an abbreviated version of a doctoral dissertation[4] in which most of the more sophisticated statistical analysis has been eliminated. It is suggested that the reader examine the complete dissertation if interested in a fuller explanation of the methodology. Secondly, it seems appropriate to review the literature related to the topic of this research and report on the main findings of previous studies. Thus, this section will be divided into three separate sub-sections. The first will discuss several theoretical considerations related to the major determinants of industrial employment. The second will review the literature related to the topic under consideration and will report its main findings. And the third will provide an abbreviated account of the methodology used in carrying out the empirical study.

2.1. Theoretical Framework: The Study of the Determinants of Industrial Employment

The study of the determinants of industrial employment usually falls within the field of economics of education. Therefore, two sets of theories could be examined when studying the employment determinants in

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[4] See Oscar E. Corvalán-Vásquez, "Comparative Study of Industrial Training in Chile." Unpublished Ph.D. Thesis, University of Toronto, 1979. (Available on inter-library loan.)

the manufacturing sector. First, there are theories which justify the investment in education, e.g., the "human capital theory," from its early stages (Becker, 1962; Denison, 1962; Shultz, 1961), until its most recent version (Blaug, 1973). But also there are theories which deny the significance of education for employment, or at least reduce in a considerable portion the impact of education, e.g., the "screening hypothesis," which shows that employers erroneously consider education as a proxy for productivity (Berg, 1970; Stiglitz, 1975; Wolpin, 1977). As a consequence, educational degrees are considered "signals" (the "signaling" hypothesis) of the productive capacity of the candidates for a particular position.

In addition, there are theories related to labor market conditions. Among them, the dual markets theories deserve some attention. Several authors (e.g., Tockman, 1977; Souza and Tockman, 1976; Merrick, 1976; and Webb, 1974) writing from a Latin American perspective, and others (M. Reich, et al., 1973) writing from a North American perspective, have pointed out that we are not in a process of homogenization of labor markets -- as assumed by neo-classical economics -- but in a process of labor market segmentation. Neo-classical analysis assumes that wage differences are due to different skill requirements (Becker, 1964). However, empirical analysis shows that income differences between modern and traditional sectors of the economy are only partially accounted for by differences in human capital, and that for equal skills sectoral differences could be as high as 50% (Souza and Tockman, 1976; Merrick, 1976; Webb, 1974).

The latter point seems particularly relevant when a study related to the performance on the labor market of former apprentices is carried out in a country such as Chile. In fact, several authors have shown the existence in this country of at least two labor markets. The first one is related to the modern, or "formal", sector of the economy; the second is related to a host of informal economic activities, mainly carried out by self-employed individuals with low education, receiving a very low income. Both operate within urban sectors, but function as if they were independent markets so far as the rewarding of labor is concerned.

Hiring and promotion policies practiced by the firms of the modern sector of the economy, of course, are geared to the prevailing model of development existing in each particular country. Thus, in capitalist economies, owners and managers of physical capital make the investment decisions, and, therefore, determine the type of technology to be used, the product chosen for production, and the organization of work. Normally, modern enterprises tend to use capital-intensive technologies rather than labor-intensive methods of production for several reasons: (a) production problems which occur in dealing with large numbers of workers; (b) government policies which tend to favor the use of capital (e.g., tax-free import of machinery); (c) prestige and promotion of advanced countries' technologies; and (d) preferences by the upper classes for import-equivalent goods, i.e., goods that closely resemble imported products. As a consequence, less labor is used than would be possible with alternate production methods.

As was stated in the Introduction, in essence, the problem of employment and unemployment is a function of overall strategies for economic development, and its solution depends upon the option chosen by the political elite of each country. In most cases, foreign capital and its use of capital-intensive technologies, as well as the region's rapid growth in population, contribute significantly to the high levels of unemployment and widespread underemployment observed in most Latin American countries.

2.2. Review of the Literature

In reviewing the literature concerned with the evaluation of different types of training, it was found that very few studies attempt to compare the results of different training systems.

With respect to research carried out in Latin America related to these topics, it should be pointed out that there have been a few reports on the impact of non-formal education programs in some Latin American countries, which indicate that these particular educational models bear little promise for promoting comprehensive structural changes in this area. LaBelle (1975), for instance, examines the influence of formal and non-formal education on income and occupational status of a sample of male employees of three large industries in Ciudad Guayana, Venezuela, showing that out-of-school programs do very little to foster greater access to economic resources. Jeffrey Puryear (1975) showed how an industrial apprenticeship program in Colombia, designed to reach disadvantaged sectors of the population, actually drew from the

relatively more privileged sectors that filled the regular secondary schools. Bruno and Van Zeyl (1975) found that individuals with alternative (non-formal) educational experiences in Venezuela were unlikely to be able to compete on the labor market with those who had conventional education, because of the single-minded response of industrial managers to formal school credentials. Finally, Riske and Rust (1975) examined occupational status and aspirations of mobility in relation to non-formal education among a sample of young workers in Port of Spain, Trinidad, and concluded that the influence of non-formal education on job attainment was comparatively negligible.

In relation to the social prestige of out-of-school programs, Zymelman (1976) pointed out that the general attitude today still is to consider formal education as the only valid type of education, while relegating vocational training to the status of a less desirable type of educational endeavor. However, this situation may be changing in a few countries like Venezuela and Brazil where, owing to a heavy demand for technicians and qualified labor, the social prestige of vocational training seems to be increasing. In most Latin American countries, however, the social stigma attached to vocational schooling is still quite strong.

Lastly, the survey of the literature on comparative studies about vocational schools and on-the-job training reports by Zymelman (1976) shows that "no country so far seems to have produced adequate answers to the questions of the relative efficiency of formal vocational schooling and on-the-job training." No conclusive evidence exists that

one method of training is superior to others, and it is necessary to investigate the structure and functions of the educational systems and the labor market of each country if we are going to make some contribution to the research and planning of vocational-technical education in Latin America.

2.3. Research Methods

Longitudinal data are normally needed to trace the career development of former apprentices and to obtain time-tested perceptions of their training. But since periodic follow-up of the same group of students is rarely available, access to lifetime career development information is almost impossible to obtain. Therefore, the sample of former apprentices examined here includes sub-samples of graduates who finished the program between 1970 and 1977, stratified according to the trade in which they were trained. In addition, a sample of industrial workers who studied in an industrial vocational school was prepared on the basis of information obtained from the firms in which the former apprentices are working. Industry supervisors provided data on education, training, age, professional experience and monthly earnings of the co-workers of the former apprentices. This method of sampling made it possible to control for the important factor of labor market segmentation (discussed previously), and for the specific occupations considered in the study. Data from these co-workers also gave access to a sub-sample of workers who completed primary school but did not continue at the secondary level

of education. A comparison is done of the effect of training on the lives of former apprentices by comparing earnings and career paths of workers who followed an apprenticeship program and those who did not.

Essentially, this study represents an output evaluation of an apprenticeship program as compared to other modes of training. Hence, process evaluation is not intended, apart from some indication for improving the program that may be obtained from the interviews with the graduates and their supervisors.

On the basis of information provided by INACAP about its former apprentices, they were sampled from different graduating groups. Female graduates were excluded from the sample as they represented less than 2% of all graduates. Since the first students finished the program in 1970, the sampling of the graduates in different trades was started from that year. As stated previously, this study is confined to examining the program in Santiago, as it represents about two-thirds of the overall national program.

The total number of graduates from the national apprenticeship system between 1970 and 1977 was 1,762. During this period of time, 1,090 apprentices graduated from the program in Santiago, but only 970 did so before March of 1977, which was the last month of graduation considered for sampling purposes. The reason for this time limit was that graduates need at least six months to find an opening in the labor market corresponding to the trade for which they have been trained. However, INACAP did not have the addresses of all the graduates. Thus,

a list issued by INACAP contained the names and home addresses of only 545 of the 970 graduates from different graduation years and trades. Subsequently, an attempt was made to locate the entire number, but in the end only 353 were located and interviewed, which represents 36% of all graduates from the program in Santiago between January 1970 and March 1977.

The next step consisted of sampling a group of enterprises in order to get information about the job performance of former apprentices and their co-workers. Only enterprises having more than nine workers were considered, because the enterprises had to be large enough to employ other workers in the same occupations as those of the former apprentices. Also, in order to simplify comparisons, it was decided to select only industrial enterprises, since this study focused only on a set of three industrial occupations and the way workers are prepared for those occupations.

The information obtained from interviewing the graduates of the apprenticeship program made it possible to locate the enterprises included in the sample. During this phase of the study, 84 direct supervisors of the INACAP's graduates were interviewed with two purposes in mind: (1) to get information about the graduate's performance on the job, and (2) to obtain information about the graduate's co-workers. In particular, information was gathered about the co-worker's education, age, training, job experience, years in the same enterprise and internal rotation, occupational category, and monthly earnings.

On the basis of that information, sub-samples were prepared which matched the INACAP graduates in terms of (a) being part of the same age group (18-30), and (b) having the same industrial occupation. However, these sub-samples differed in terms of the present occupational category of the workers (categories run from unskilled worker to supervisory positions, within the same industrial occupations). It was impossible, however, to select workers between 18 and 30 years of age during the process of collecting these data. More data than necessary were therefore collected in order to match the characteristics of INACAP's graduates. Since it was considered vital to the study to get information about all workers in the workshops who had the same industrial occupation as the INACAP graduate, information was also gathered about people who were over 30 years of age, as well as about people who had considerably more or less education than the three main categories of education background of principal interest in the comparison of the INACAP's graduates. These three categories were: (1) elementary education only; (2) general secondary education; and (3) vocational secondary education. The group of workers who were discarded from the sample consists of people who had less than 6 years of elementary schooling and people who had some university education.

The last step in the sampling procedure consisted of obtaining information about employers' hiring preferences and their views on apprenticeship. As was mentioned above, the direct supervisors on INACAP's graduates in 84 enterprises were interviewed. An attempt was made to interview the management of all these 84 firms, but valid answers were only obtained

for 68 of them. During this phase of the study, only middle-management personnel was chosen and top management was excluded in big companies. The rationale for selecting only mid-level managers in big companies was that they do the routine hiring for a wide variety of positions, whereas top management is predominantly concerned with making larger policy decisions.

Thus, according to the methodology of the study, three kinds of survey instruments were selected: (1) a general schedule for collecting data on the structure and functioning of the apprenticeship program and the formal education system; (2) a cost schedule used to collect data on the cost of the apprenticeship program and that of vocational schools; and (3) three questionnaires designed to interview INACAP's graduates, their supervisors, and employers, respectively.

III. MAJOR RESEARCH FINDINGS

3.1. Basic Characteristics of the Trainees

In this section of the study, we intend to draw a general profile of the average individual who uses the INACAP apprenticeship system to become a skilled worker. Since this study was confined to the capital of the country, and given the fact that population there has been growing faster than in the rest of the country during the last decade, it was considered relevant to investigate to what extent the program is serving the children of new immigrants to Santiago. The results of this analysis are summarized in Table 1.

TABLE 1

DISTRIBUTION OF THE APPRENTICES BY PLACE OF BIRTH

	Number	Percentage
Metropolitan Santiago	323	91.5
Other Large City (more than 250,000)	2	0.6
Intermediate City	15	4.2
Small Town	10	2.8
Rural Area	3	0.9
TOTAL	353	100.0

As can be seen in Table 1, most of the INACAP apprentices were born in Santiago or some other large city (92.1%), a slight minority (7%) was born in an intermediate city or small town, and less than 1% was born in a rural area. In other words, the results of our survey suggest that the INACAP apprenticeship program has not been serving the children of rural immigrants in particular, who are supposed to be the more disadvantaged group of the population. Thus, a second question which appears interesting to explore is the family socio-economic background of the average student who enters apprenticeship in Santiago. We explored this question by asking our respondents to state their fathers' education and occupation, as well as an estimation of the level of income their families had by the time they were enrolled in the apprenticeship program.

Table 2 shows some selected findings regarding the family socio-economic background of the average student seeking training from the INACAP apprenticeship program. It is worth noting that more than two-thirds of the apprentices' fathers had received complete primary schooling or less, and that only 8.8% had completed secondary education. In order to better grasp the meaning of these figures, we have included the level of education attained by the overall adult population of Santiago by 1970. In comparing both columns of percentages, it is easily realized that the apprentices' fathers have less education than the average adult inhabitant of Metro Santiago, and that the program is thus serving the more disadvantaged groups of the area.

TABLE 2

SELECTED FINDINGS REGARDING FATHERS' EDUCATION, OCCUPATIONAL STATUS, AND FAMILY INCOME LEVEL

A. Fathers' Education	Sample of Trainees No.	%	Metro Santiago[1] 15+ Age Group No.	%
None	32	9.0	145,594	8.8
Primary Incomplete	90	25.5	754,296	45.9
Primary Complete	144	40.8		
Secondary Incomplete	55	15.6	672,934	41.0
Secondary Complete	31	8.8		
University Incomplete	1	0.3	67,802	4.3
Total	353	100.0	1,640,626	100.0

B. Fathers' Occupational Group		Metro Santiago[2] Labor Force	%
Unskilled Labor	47.8		25.07
Skilled Labor	19.0		27.16
White-collar Workers	26.6		17.15
Middle-level Administrators & University Trained Professionals	3.1		7.60
Upper Level Administrators	0.0		1.89
Others and Non-classified	3.4		21.15
Total	353	1,077,909	100.00

C. Family Income Level (%)	Sample	No. of Brothers	
Less than 1 minimal wage	18.4	None	1.7
1 to 2 minimal wages	56.6	1 to 3	21.8
2 to 3 minimal wages	14.1	4 to 6	41.6
4 to 5 minimal wages	5.4	7 to 9	26.9
More than 5 minimal wages	5.4	10+	7.9
Total	100.0		100.0

D. Respondents' Evaluation of their Family Income Levels	
Less Than Sufficient	70.5
Sufficient	29.5
Total	100.0

[1]Source: Instituto Nacional de Estadistica; Censo 1970, Santiago, Chile.

[2]Source: Departmento de Economia, Analisis del stock de Recursos Humanos, Universidad de Chile, Documento de Inv. No. 19, Junio 1977.

A second indicator of the apprentices' family background used in this study was a classification of the fathers' occupational groups, done on the basis of occupational prestige studies made in Santiago by Carter and Sepulveda (1964). Here, again, it was decided to compare the distribution of the sample to the distribution of Santiago's entire population, as provided by the 1970 Census. It was found that while only 25% of the work force of Santiago had been classified as unskilled labor in 1970, 47.8% of the apprentices' fathers were actually unskilled workers. Further, while the skilled workers group represented 27% in 1970, only 19% of the present sample were found in this category. White-collar workers, however, were a little overrepresented in the sample. Thus, it could be argued that from an occupational prestige standpoint, the fathers of the apprentices belong to the lower prestige occupations, even lower than the average worker of Santiago.

Finally, the family income figures clearly show that the average income of the apprentices' families was less than sufficient by the time they were enrolled at INACAP. This is particularly true when we consider the rather high number of brothers and sisters that each trainee has.

With regard to the characteristics of the apprentices themselves, it is worth noting their present age, previous and post-apprenticeship schooling, their past grading, and their present educational and occupational aspirations. It is assumed that these two sets of indicators are useful for understanding the general characteristics of the group of trainees being examined.

It becomes evident from Table 3 that we are dealing here with a group of young workers whose mean age is 23 years, with a standard deviation of 2.38. As has been indicated (pages 22-24), the sample is composed of apprentices who finished their programs during the period 1970-1977; therefore, we should not expect people older than 30 years of age to be in the sample. This implies that when comparing the graduates' performance on the job, we should refer to other people of the same age group, and, therefore, older workers should be excluded.

TABLE 3

AGE DISTRIBUTION OF THE GRADUATES OF THE APPRENTICESHIP PROGRAM

Years of Age	Number	Percentage
18-20	54	15.4
21-23	142	40.2
24-26	145	41.0
27-30	12	3.4
TOTAL	353	100.0

The educational background of this group of apprentices is also an important factor to consider. It has been mentioned elsewhere in this paper that the formal educational requirement for entering apprenticeship is completed elementary education. Since the highest level of primary

education was raised from grade 6 to grade 8 by the educational reform of 1967, some graduates in the sample had completed 6 years, while others had completed 8 years of elementary schooling.

Table 4 shows that about 78% of apprentices had completed elementary education before entering the apprenticeship program. The remaining 22% had some secondary education, although 13% had only completed grade 9. The last fact may be interpreted in the sense that some students realized that the secondary school program was not a suitable alternative for them and decided to enter the apprenticeship program instead. This is borne out by Table 5, with its summary of reasons given by them. In effect, 17.2% of the apprentices declared that they had entered INACAP because they were unable to continue secondary education, whereas 81.9% declared that they had entered the program in order to learn a trade more quickly.

TABLE 4

HIGHEST LEVEL OF EDUCATION ATTAINED
BEFORE ENTERING APPRENTICESHIP

Primary School	Number	Percentage
Grade 6	17	4.8
Grade 7	18	5.1
Grade 8	240	68.0
Secondary School		
Grade 9	47	13.3
Grade 10	14	4.0
Grade 11	11	3.1
Grade 12	6	1.7
TOTAL	353	100.0

TABLE 5

REASONS FOR ATTENDING APPRENTICESHIP

Reason	Number	Percentage
Unable to continue in Vocational School	34	9.6
Unable to continue in a General Secondary School	27	7.6
To learn a trade	92	26.1
To learn a trade quickly and gain employment	197	55.8
To obtain a better job than before INACAP	3	0.9
TOTAL	353	100.0

Another aspect which was considered worth evaluating was the graduates' performance while they were still enrolled in the apprenticeship program. Since it was impossible to obtain actual grades for all students from INACAP, it was decided to ask the graduates to rank themselves on a three-point scale. The results are shown in Table 6.

It becomes evident from Table 6 that more than 50% of the graduates see themselves as performing above the average during the apprenticeship course. Thus, we assume that the ones who do finish it, perceive themselves as being in a somewhat superior position.

This estimate of the apprentices' performance was also checked against the degree of difficulty they had during the courses in Mathematics and Writing. The results were quite consistent with the self-reported evaluation of their performance in the courses.

TABLE 6

SELECTED FINDINGS REGARDING APPRENTICES
SELF-REPORTED GRADES

Performance	Number	Percentage
Below Average	25	7.1
Average	123	34.8
Above Average	205	58.1
TOTAL	353	100.0

Furthermore, the graduates were asked about their educational aspirations. Although only 8 of them were at the time of the interview pursuing their studies on a full-time basis (6 at the university level, and 2 at the secondary level) most graduates wished to pursue further education later. In effect, 24 of them were studying in the evenings to complete their secondary education. The ones who were studying in a vocational school declared that the school had accepted their previous three-year course at INACAP as equivalent course work in the school. Thus, despite the fact that full recognition is granted to course work done at INACAP, only a minority of the graduates were pursuing their studies. Hence, it could be argued that INACAP graduates look at the apprenticeship program as a terminal program rather than as another step toward entering the university.

TABLE 7

EDUCATIONAL ASPIRATIONS OF THE GRADUATES
WHO WERE NOT STUDYING

Level of Aspirations	Number	Percentage
None (doesn't want to pursue education)	9	2.8
Other type of training (Army training)	27	8.4
Vocational Education	67	20.9
General Secondary Education	88	27.4
University Education	130	40.5
TOTAL	321	100.0

What is surprising about the graduates' educational aspirations is the high number who wish to pursue university-level studies. Table 7 provides evidence that more than 40% of them are willing to pursue higher education, despite the fact that they have been unable to do so in the past. In addition, 27.4% of them would like to attend high school. This evidence seems to indicate that the prestige of general education exerts a powerful influence in Chile. This influence also affects skilled workers, who have little (if any) chance of pursuing academic studies.

Finally, it appears important to examine what the graduates' occupational aspirations are, and whether these aspirations are consistent with the training received by the graduates at INACAP.

Table 8 provides evidence for the argument that 50% of the graduates would prefer not to work as skilled laborers or craftsman. In effect, 28.5% of the respondents declared that they would like to follow a white-collar occupation; another 21.2% expressed a desire for an even higher status occupation. These findings, however, should not be interpreted as meaning that half of the graduates wished to leave the trades for which they were trained. In fact, more than three-quarters of them declared that they intended to continue working in the same trade. Therefore, it appears that they were willing to continue working in the same trade, but at a higher level, i.e., as a technician. In order to do so, they would need to pursue further education -- which is exactly what most graduates also declared that they had planned.

TABLE 8

OCCUPATIONAL ASPIRATIONS OF INACAP GRADUATES

Occupational Group Aspirations	Number	Percentage
Skilled Laborers	177	51.3
White-collar workers	101	28.5
Mid-level Administrators and University Trained Professionals	75	21.2
TOTAL	353	99.8
Proportion Planning to Continue in Their Trained-For Trades		
Intend to continue in same trade	271	76.8
Do not intend to continue in same trade	82	23.2
TOTAL	353	100.0

Before leaving the subject, it might be important to note that while the majority of the graduates would like to pursue their studies in high school and eventually in university, in fact only 9% of them were found to be studying on a part-time or full-time basis. Indeed, this aspiration could be fulfilled only in an ideal situation. Given the scarce number of educational opportunities available in Chile, most graduates are likely to remain blue-collar workers.

3.2. The Relationship Between Apprenticeship, Employment and Earnings

3.2.1. The Apprenticeship Experience

In order to evaluate the graduates' perception of their INACAP training as a suitable preparation for their present jobs, we asked them to assess the percentage of skills and knowledge learned during the program that they had had the opportunity to apply in their professional career. The answers were marked on a three-point scale representing three categories: (1) less than 25%; (2) about 50%; and (3) more than 75%. Table 9 shows that more than 50% of the graduates declared to have used more than three-quarters of the skills learned at INACAP in their professional life. Just over 16% had used about a half of the skills learned, and about 30% declared to have used less than 25% of the skills learned at INACAP. The low proportion applied by this last group probably relates to long periods of unemployment.

TABLE 9

PERCENTAGE OF APPRENTICESHIP TRAINING APPLIED BY THE GRADUATES[1]

Category	Number	Percentage
Less than 25 percent	99	30.1
About 50 percent	53	16.1
More than 75 percent	177	53.8
TOTAL	329	100.0

[1]Twenty-four of the 353 graduates interviewed did not have enough job experience as yet to make the assessment asked.

In an effort to probe somewhat deeper and determine more specifically what the graduates either liked or disliked about their training at INACAP, two structured questions were asked. The first was an attempt to tap the graduates' opinion about the importance of each major component of the program. The second related to possible program deficiencies found by the graduates. The results are reported in Table 10.

There is evidence in Table 10 supporting the view that apprentices found the practical instruction at the INACAP workshops to be the most important component of their training. Second in importance were the classes on related theory. Here, however, there were some complaints that the classes ought to be more extensive to enable apprentices to better develop their professional careers. Probably the most problematic area of any apprenticeship program is the practical work done

in plants or enterprises. About one-fourth of the graduates complained that there was a lack of INACAP supervision in plants, thereby allowing the employers to use the apprentices in tasks not related to the training program. But only 14.7% found deficiencies during their practical work in plants.

TABLE 10

IMPORTANCE AND DEFICIENCIES ATTRIBUTED TO SOME PARTS OF THE PROGRAM

Program Component	% Very Important	% Less Important	% Deficient
Related Theory	47.0	53.0	28.6
Practical Instruction at Workshop	76.5	23.5	8.5
Practical Work, in Plants	43.1	56.9	14.7
INACAP's Supervision in Plants	0.0	0.0	23.5
Total Number = 353	TOTAL		100.0%

In order to have an overall assessment of the value of the apprenticeship program, the graduates were asked to rate it on a conventional scale of seven points (used in Chile for grading). Rank one means very poor, four means acceptable, and seven means excellent.

Table 11 provides additional support for the view that the majority of graduates found the program quite good. None of them found it less than acceptable, and about one-fifth rated it as excellent. Of course,

these ratings may be influenced by the rather high proportion of graduates who were found unemployed when the interview took place. Thus, it could be safely argued that a better employment situation would even improve the graduates' evaluation of the program.

TABLE 11

GRADUATES' OVERALL EVALUATION OF THE APPRENTICESHIP PROGRAM

Rank	Number	Percentage
4 (Acceptable)	9	2.5
5 (More than acceptable)	80	22.7
6 (Good)	188	53.2
7 (Excellent)	68	19.3
No answer	8	2.3
TOTAL	353	100.0

$\bar{X} = 5.77$

3.2.2. Employment Status of the Graduates of INACAP's Apprenticeship Program

One of the basic concerns of any vocational training program is the degree of employability of its graduates. This is particularly true for an apprenticeship program, which is characterized by the provision of training while the trainee is employed by the enterprise. This implies

that presumably all apprentices have an employment by the end of the apprenticeship course. Although this may be true in the majority of cases, there also exists a practice on the part of some employers to accept more apprentices than they are willing to hire at the end of the program. This might be explained either by the fact that they are allowed to pay apprentices less than minimal wage, or that they want to retain only those apprentices who show a greater commitment to their jobs. Furthermore, in a labor market characterized by high unemployment rates at all levels, it would not be surprising to find a proportion of the graduates unemployed. In such a situation, it would be unreasonable to expect every single one of the graduates to work in their trained-for trades. Therefore, we should consider with some caution the figures in Table 12 about the present employment status of the INACAP graduates.

As is shown in Table 12, a rather high proportion of the graduates was unemployed (22.9%) at the time of the interview. This rate of unemployment, however, is by no means peculiar to INACAP's trainees. In 1977, the average rate of open unemployment in Chile was 15.8%, but in 1976 it had reached 25.3% in the 15-to-24 age group. In addition, the unemployment rate was particularly high for individuals within the 15-to-24 age group who had three years of secondary education or less. Their unemployment rate in 1975 was 31.4% (I.L.O., 1978; ODEPLAN, 1977).

TABLE 12

EMPLOYMENT STATUS OF THE INACAP APPRENTICESHIP GRADUATES

Employment Status	Number	Percentage
Employed in their trained-for related trade	167	47.3
Employed in a different trade	48	13.6
Self-employed in their trained-for trade	16	4.5
Self-employed in a different trade	14	4.0
Unemployed, not registered in employment agency	69	19.5
Unemployed, registered in the government employment agency	12	3.4
Out of the work force (student, military service)	27	7.7
TOTAL	353	100.0

Thus, the percentage of unemployed INACAP graduates was slightly lower than the rate of unemployment for their age group. Furthermore, if we look at the employment opportunities for skilled workers in a sample of industrial occupations, the above observed unemployment situation becomes more evident. The present writer has attempted to explore the demand for three groups of industrial occupations by collecting data on supply and demand

of skilled workers in the ten more industrialized municipalities of Metro Santiago. Data were obtained in the second semester of 1977, from the government employment and training agency (SENCE).

TABLE 13

SUPPLY AND DEMAND OF SELECTED INDUSTRIAL OCCUPATIONS IN SANTIAGO

Occupation	Registered Supply	Registered Openings	Number Hired	% Hired
Toolmakers, metal pattern makers, metal markers and machine-tool operators	160	100	44	27.5
Machinery fitters, machine assemblers and motor-vehicle mechanics	289	70	23	8.0
Electrical fitters, maintenance, building and vehicle electrician	242	42	22	9.1
Oxygen and Arc Welders	141	78	50	35.5
TOTAL	832	290	139	(16.7)

[1] Source: Oficinas Municipales de Empleo: Santiago, Maipu, San Miguel, Quinta Normal, Conchali, La Cisterna, San Bernardo, La Granja y Quilicura.

Table 13 makes clear that there are just a few openings available in Santiago in occupations related to the metal-mechanics area. Furthermore, it should be noted that only a minority of unemployed workers register at the Municipal Employment Agencies: in our sample of INACAP's graduates, only 14.8% of those unemployed had registered in one of them. Thus, it could easily be assumed that unemployment among these categories of

workers is probably higher than the figures in Table 13 suggest. Additional support for the latter view is provided by a tabulation carried out by the author on the basis of data collected by the national service for vocational training and employment. This study shows that during the first half of 1975, there were 143 openings in industrial occupations in Metro Santiago and 798 registered unemployed skilled workers in the same trades.

3.2.3 The Determinants of Earnings Among Apprenticeship Graduates

As was stated in the Introduction, one of the main concerns of the present study is to explain variations in earnings of individuals who have received the same kind of training, namely, an industrial apprenticeship program. Therefore, the present section focuses on the analysis of the influence of the personal characteristics and work situation of the INACAP graduates on their present level of earnings. The second part of the study, however, is devoted to examining variations in earnings of individuals who have received a different kind of training, but who are presently working in similar occupations in the same industries where the INACAP graduates work.

Thus, with regard to variations observed in the INACAP graduates' level of earnings, it can be argued that the factors influencing the graduates' earnings may be classified into three basic sets of factors:

1. The first refers to those variables pertaining to the personal characteristics of the trainee, such as age, family socio-economic background, and educational achievement.

2. The second refers to the graduates' educational and professional experiences, i.e., post-apprenticeship educational attainment, field of specialization in the training program followed, year of graduation, and professional experience.
3. The third refers to the graduates' present work situation, as described by such variables as present occupation, category within the occupation, average weekly hours of work, and size of the enterprise where now employed.

Of course, there may be other sets of factors influencing the graduates' present level of earnings. As has been previously discussed in this study, the type of final product produced by the enterprise can influence its profit and labor-rewarding policy. But, unfortunately, there are no reliable data on these types of variables that could be included in the analysis.

Examination of the variations in earnings can be done using several statistical techniques. The two most commonly utilized are: cross-tabulation analysis of earnings and each of the relevant independent variables; and multiple regression, which allows a group of independent variables to be entered simultaneously in the analysis. Regression analysis will be used here to examine the effect of each variable of earning. In mathematical terms, variations on earnings (Y) can be explained by three sets of variables (a, b, c) plus an independent factor related to the position in the market structure of the firm or company for which the graduate is at present working (here called "m"). Therefore,

$Y = f(a, b, c) + m$. In this particular case, the solution of the equation:

$$Y = a + b_1x_1 + b_2x_2 + \ldots b_kx_k + m$$

is obtained by performing a least squares regression, where,

Y = monthly earnings in Chilean pesos

a = the point at which the regression line crosses the Y axis.

"b... b_k" are the regression coefficients which represent the slope of the regression line and indicate the expected change in Y with a change of one unit in x. The proportion of variance explained, or the goodness of fit of the regression equation, can be evaluated by examining the square of the multiple regression (R^2).

Thus, multiple regression analysis was used to explain variation in the graduates' present level of earnings. However, given the fact that we are here dealing with a quite homogeneous sample, there were just a few independent variables which showed a significant relationship to monthly wages.

An attempt was also made to use other equations with squared values for independent variables and a logarithmic transformation of the dependent variable. None of these showed a better fit of the regression curve. Subsequently, it was decided to select two sets of the more significant variables for the analysis. The first set corresponded to basic characteristics of the trainee, such as age, family socio-economic status, schooling and educational achievement. The second set referred to his present work situation, and related to such variables as occupational category within the trade, weekly hours of work, job experience, and size of the enterprise for which he is working.

Table 14 shows the means and standard deviations for a selected group of variables. With regard to the variables related to the trainee's characteristics, it can be seen in Table 14 that: (1) the income level of the trainee's family varies a great deal; (2) the average father's occupational status is quite low, but it must be noted that its standard deviation is fairly important; (3) schooling and achievement do not vary to any great degree. As for variables related to the INACAP graduates' job experience and present work situation, it should be noted that the sample presents considerable variation in years of job experience, while all the variables representing the graduates' work situation present some variation.

The variables selected for the regression analysis were those which showed a statistically significant relation to earnings in preliminary regressions. On the basis of that criterion, the graduate's field of specialization, present occupation, and personality variable were excluded from the analysis.

Table 15 shows some of the main findings related to the correlation of several independent variables on the level of earnings of INACAP's trainees. First, it shows that the influence of the trainee's family socio-economic status (SES) is rather negligible. However, given the information provided in this paper on the basic characteristics of the trainees, it could be argued that the family SES has affected their educational choice, thereby affecting their occupation and present level of income. Second, the previous table (Table 14) shows that the weekly

TABLE 14

DESCRIPTIVE STATISTICS OF SELECTED VARIABLES
FOR THE INACAP TRAINEES' SAMPLE (N=352)

Variable	Mean	S.D.
AGE (Age of the trainees)	23.00	2.28
FATHOCUP (Fathers' occupational status: 7 point scale)	1.86	0.98
NIVINGPA (Income level of the trainee's family)	2.87	4.42
FAMSES (A composite index of FATHOCUP and NIVINGPA)	4.49	4.04
SCHOOLIN (Highest level of schooling attained by the trainee)	8.22	1.02
ACHIEVE (Estimation of school achievement of trainee)	5.88	1.42
WEEKLYHR (Weekly hours of work of the trainee)	47.56	8.92
SIZEFIRM (Size of the enterprise in a 6 point scale)	2.77	1.71
PROFEXP (Job experience of the trainee in years)	4.01	2.28
CATAC (Present occupational category within the trade measured in a 7 point scale)	5.02	1.80
CATIN (Entry occupational category within the trade)	4.73	1.72
MONWAGES (Monthly wages of the trainees in 1,000 pesos)	3.183	1.486

TABLE 15

ZERO ORDER CORRELATION MATRIX FOR SELECTED VARIABLES INFLUENCING THE TRAINEES' LEVEL OF EARNINGS

	WEEKLYHR	SIZEFIRM	PROFEXP	CATAC	ACHIV	WAGES (N=231)[1]
FAMSES[2]	-.03	.02	.09	.04	.14	.05
WEEKLYHR	-	.10	.05	-.19	-.13	.07
SIZEFIRM		-	.19	-.31	-.02	.01
PROFEXP			-	.13	.00	35
CATAC				-	.02	.06
CATIN					-	.06
WAGES						-

[1]Because of the differences in employment status of the graduates, each calculation is based on a different (N) number of subjects.

[2]For a full name of the variables' acronyms, see Table 14.

number of hours worked by the trainees is solely correlated with the higher number of years of job experience. Third, the size of the enterprise does not show a significant positive relationship with the level of wages paid to its workers. The low correlation of firm size with wages is not necessarily relevant to the labor market segmentation hypothesis briefly referred to in Section 2.1., since for the purposes of this analysis smallest firms were excluded. Nonetheless, Table 15 shows some positive correlation (.19) between size of the firm and years of professional experience, which in turn is highly correlated (.35) with monthly wages. That is to say, workers with more years of professional experience can be expected to be employed in bigger firms and to be receiving higher earnings.

It also appears that in bigger enterprises the trainees have the tendency to be employed in a relatively lower occupational category (within a given trade). This suggests that the organization of tasks in bigger enterprises is such that they require fewer skilled workers than smaller enterprises. In addition to this, the entry levels for each trade seems to be lower in bigger enterprises than in the smaller ones. Furthermore, Table 15 shows that there is a small positive correlation between the number of years of professional experience of the trainee and his present occupational category. Finally, evidence is shown to support the fact that a positive relationship exists between the level of earnings of the trainees, and their present occupational category.

TABLE 16

REGRESSION EQUATION ON INACAP TRAINEES' WAGES AND WORK SITUATION

Independent Variables	Regression (B) Coefficients	Beta Coefficients	F Test (N=231)
PROFEXP[1]	.037	.327	26.67*
CATAC	.070	.037	Multiple R = .34 2.10*
CATIN	.002	.003	Adjusted R^2 = .10 .027
WEEKLYHR	-.014	-.073	Adjusted R^2 = .12 1.36
SIZEFIRM	-.036	-.001	Standard Error = 1.41 .030
Constant (A)	2.685		

*Significant at the $p < .05$ level.

[1]For a full name of the variables' acronyms, see Table 14.

Table 16 shows the results of a regression equation for the influence on earnings of a group of variables related to the trainee's work situation. The results could be summarized as follows:

1. The overall variance explained by the set of independent variables is 12% (R^2 = .12). This means that the above equation should not be used to predict level of earnings of industrial workers of Santiago employed in the three sets of trades being examined, because of the low contribution of this set of variables.
2. Only the number of years of professional experience, ("PROFEXP") and present occupational category ("CATAC"), have a significant relationship to the level of wages. The size of the enterprise ("SIZEFIRM") and weekly hours of work ("WEEKLHR") were found not to be significant, when the F test was applied to these variables.
3. The equation shows that the average trainee might start earning 2,685 Chilean pesos a month[5] and increase his earnings by about 100 Chilean pesos with each year of job experience.

Although multiple regression analysis may be useful to examine some relationships between variables (as the ones specified above), cross-tabulation analysis may be of greater practical use when examining the relationship between a dependent variable and several independent variables, one after the other. For instance, cross-tabulation analysis can be used to determine whether trainees employed in their trained-for trade have higher earnings than the ones employed in a different trade, or whether the ones self-employed earn more than the ones employed. Since this

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[5]The minimal wage was 1,400 Chilean pesos in November 1977, when the data were collected.

problem appears to be an important question related to the performance of the apprenticeship system, it was decided to examine it closely, using a cross-tabulation of frequencies for earnings and each of the employment status categories.

The following conclusions could be drawn from Table 17: (a) graduates employed in their trained-for trade have higher earnings than those employed in a different trade; (b) self-employed graduates earn more than those who have an employer; (c) self-employed graduates who work in their trained-for trade receive a monthly earning slightly lower than those working in a different trade. However, the last statement should be interpreted with caution because of the low number of self-employed individuals (14) in a different trade. In addition, it should be noted that the Chi-square test suggests that there is a significant relationship between the level of earnings and the graduate's employment status.

The above findings are particularly important when examining the degree of flexibility of the training provided by INACAP. In effect, if the graduates are employed in a trade not directly related to the training received, and they still receive relatively high earnings, then, this could be interpreted as an indicator of positive occupation flexibility provided by the training program. However, the evidence shown in Table 17 does not support such a hypothesis.

There are two additional independent variables whose influence on earnings is worth mentioning. The first one is age. The second is year of graduation. Of course, because of the apprenticeship program entry

TABLE 17

PRESENT EMPLOYMENT STATUS OF INACAP'S GRADUATES, BY THEIR MONTHLY EARNINGS
(In Chilean Pesos, November 1977)

Employment Status		1,000 2,000	2,001 4,000	4,001 6,000	6,001 9,000	Mean	S.D.	Median
Employed in their trained for or related trade	164 (100.0)	25 (15.2)	101 (61.6)	30 (18.3)	8 (4.9)	3,234	1,396	2,717
Employed in a different trade	48 (100.0)	17 (35.4)	26 (54.2)	5 (10.4)	- -	2,625	1,098	2,519
Self-employed in their trained for or related trade	17 (100.0)	3 (17.6)	7 (41.3)	6 (35.4)	1 (5.9)	4,100	2,097	3,875
Self-employed in a different trade	17 (100.0)	2 (11.7)	6 (35.3)	7 (41.3)	2 (11.7)	4,077	1,869	4,125
Other categories[1]	106							
(N = 352)								

[1] Includes unemployed and out-of-work force.

Chi-squared = 28.62 (with 12 degrees of freedom, significant at the $p < .005$ level).

Pearson's R = .11 (significant at the $p < .05$ level).

requirements, both are highly correlated. Normally older trainees will graduate before younger trainees. Thus, instead of analyzing in some detail the influence of age on earnings, it seems preferable to look at the effect of the graduation year on earnings.[6]

The year of graduation can have a double influence in determining the graduate's present level of earnings. Firstly, it has an indirect influence through the number of years of professional experience for the graduates; secondly, it can have a direct influence under certain circumstances. For instance, the state of the economy at the time of graduation may be an important factor determining the availability of a first full-time job for the graduate. More specifically, in the case of the Chilean economic system, there have been major changes in the economic policy between 1970 and 1977. The first one occurred in 1970 when the government of Salvador Allende was installed, and the second one in 1973 with the take-over by the present military government. In addition, it could be assumed that the job market opportunities were greater for the graduates during the first period than during the second period, simply because there might be a decrease of job opportunities as more graduates were produced by the apprenticeship system. Thus, it was decided to explore this matter using a cross-tabulation of the data on graduates' earnings, classified according to the gradvates' year of graduation.

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[6] A table with joined frequencies for age and earnings is given in the Appendices of the author's Ph.D. Thesis (Table A8, p. 212) for those interested in further data on the matter.

Table 18 shows that the graduates who finished their program between 1970 and 1973 were earning considerably higher wages than those who finished it between 1974 and 1977. The Tau and Gamma measures of association are relatively high and the correlation coefficient (R) between year of graduation and level of earning is fairly strong; that is to say, the effect of years of experience is fairly important in determining workers' earning levels. However, it was impossible to determine what was the exact proportion of the variance which could be explained by the government changes in economic policy and what was the proportion explained by the saturation of job market opportunities, since both go hand in hand.

TABLE 18

GRADUATES' LEVEL OF MONTHLY EARNINGS
(IN CHILEAN PESOS) BY PERIOD OF GRADUATION

Graduation Years	1,000-2,000	2,001-4,000	4,001-6,000	6,001-10,000	Total
1970-1973	17 (13.5%)	76 (55.9%)	34 (25.0%)	9 (6.6%)	136 (100%)
1974-1977	31 (28.2%)	64 (58.2%)	13 (11.8%)	2 (1.8%)	110 (100%)
TOTAL	48	140	47	11	246

Gamma = .40; Tau C = .30 p .001; Eta = .37; R = .34

3.2.4. Summary and Conclusions of the Section

In general, the results presented in Section III show that the INACAP apprenticeship program has been drawing its student clientele from the more disadvantaged groups of the population, and this factor makes INACAP's educational task more difficult. A stronger argument to support this statement will be provided in the following section of the present study, in which the family socio-economic characteristics of INACAP's trainees will be compared to the ones of vocational school students.

The findings in Section III also provide evidence for the fact that the majority of the students entering apprenticeship programs have rarely continued their formal schooling beyond the compulsory education level, and that they enter an apprenticeship program because they want to learn a trade more quickly than in vocational schools. However, many of the graduates from the program do not look upon it as a terminal educational program and aim at pursuing further education to become a technician in the trade they have chosen.

The analysis of the relationship between apprenticeship and employment indicates that only about a half of the graduates were working in their trained-for trades and nearly a quarter of them were unemployed. This last fact undoubtedly influences the cost/benefit analysis of the program attempted in Section V.

Finally, the rather homogeneous characteristics of the sample of INACAP graduates precluded a full analysis of the variance of monthly earnings of each graduate. Only their present work-situation variables were useful in explaining, to some extent, such variations.

IV. ANALYSIS OF THE FINDINGS

4.1. How Apprenticeship Compares to Other Training Modes

The present section focuses on three questions essential to assessing the level of success of the INACAP apprenticeship system. First, how does apprenticeship compare to other training systems in terms of several indicators of job performance by its graduates? Second, what are the alternatives available for the training of industrial workers? And, third, what are the main factors influencing industrial workers' salaries, apart from their educational backgrounds?

In this part, an attempt is made to provide an assessment of the graduates' on-the-job performance, in comparison to their co-workers. There are several indicators of the job performance of graduates from different educational programs. However, from the production standpoint, the most important characteristics of the workers are those related to the worker's productivity. In some cases, the worker's productivity is easier to measure than in other situations. For instance, it is easier to establish the labor level of productivity when the worker is doing piece-work than when the worker is part of a team responsible for a certain amount of production. Thus, instead of including one measure of the output of the worker's production, it was decided to include

several indicators which experience has proved to be related to a worker's productivity. The indicators chosen were the following: (a) quality of work, as assessed by the worker's supervisor; (b) efficiency, as established by the output of the worker's production; (c) work discipline, as evaluated by the supervisor; (d) worker's responsibility; (e) worker's safety in his work, as measured by the number of days lost because of personal accident; (f) ability to work in a team; and (g) need of assistance and supervision.

In order to establish the INACAP graduate's performance on each of the indicators described, a three-point scale was designed which allows for comparing the graduate to his co-workers in the same occupation. Thus, the graduate's supervisor at work was asked to rank each indicator as higher, similar, or lower. Table 19 shows the results of such assessment.

As may be seen in Table 19, each of the indicators shows that most of the INACAP graduates have a higher or similar level of job performance as compared to their co-workers. Also, the distribution of the supervisors' evaluation is more or less the same for each of the seven indicators proposed by the investigator. However, it seems appropriate to use the arithmetic means for the percentages in each category to have an overall evaluation of the productivity of the graduates.

The results presented in Table 19 indicate that 42% of the graduates were considered to be more productive than their co-workers, another 42.5% were equally productive, and 11.5% were considered less productive, while 4% of the supervisors were unable to evaluate the worker's productivity in terms of the proposed indicators. Thus, according to these indicators,

TABLE 19

JOB PERFORMANCE OF THE INACAP GRADUATE IN COMPARISON TO HIS CO-WORKER

Graduate's Job Performance on:	Higher Number	%	Similar Number	%	Lower Number	%	No Answer Number	%	Total Number	%
Quality of Work	36	42.9	36	42.9	9	10.7	3	3.6	84	100.0
Efficiency	31	36.9	37	44.0	13	15.5	3	3.6	84	100.0
Work Discipline	41	48.8	33	39.3	7	8.3	3	3.6	84	100.0
Responsibility	41	48.8	32	38.1	8	9.5	3	3.6	84	100.0
Worker Safety	34	40.5	34	40.5	12	14.3	4	4.8	84	100.0
Ability to Work in a Team	32	38.1	44	52.4	4	4.8	4	4.8	84	100.0
Need of Supervision	32	38.1	34	40.5	15	17.9	3	3.6	84	100.0
Arithmetic Means for Percentages		42.0		42.5		11.5				100.0

it should not be surprising to find that INACAP graduates have higher earnings than their co-workers. This question, however, will be dealt with later in this section.

Nonetheless, given the fact that 11.5% of the INACAP graduates were considered less productive than their co-workers, an attempt was made to establish some of the most common deficiencies presented by this particular group of workers. Three basic deficiencies were mentioned by the supervisors. First, lack of workshop practice, which is quite understandable if it is recalled that the sample was mainly composed of young workers, some of them with little job experience. Secondly, some supervisors complained that in some graduates the apprenticeship program did not develop the kind of personality needed to deal with other workers in industrial settings.[7] Thirdly, there were a few complaints in the sense that some graduates lacked theoretical knowledge related to their trades. This last criticism is, of course, related to the fact that the number of hours devoted to the teaching of related theory is lower in apprenticeship courses than in vocational schools courses.

In addition, a test for consistency of the previously stated supervisors' opinions was designed. The supervisors were asked about the prerequisites necessary for upgrading the graduates. And, as may be seen in Table 20, these answers were quite consistent with the previously

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[7] As for the inadequate personality characteristics of some graduates, it may be worth mentioning that some of the apprentices were recruited from institutions caring for orphans and, thus, they may not have developed the appropriate personality characteristics of a child raised in a middle-class family.

TABLE 20

PRE-REQUISITES NECESSARY FOR GRADUATES TO BE UPGRADED

Prerequisite	First Preference	Second Preference	Third Preference	No Answer	Total
More job experience	28 (33.3)	1 (1.2)	1 (1.2)	54 (64.3)	84 (100.0)
Seniority in the firm	19 (22.6)	7 (8.3)	3 (3.6)	55 (65.5)	84 (100.0)
Better theoretical knowledge of the trade	17 (20.2)	7 (8.3)	1 (1.2)	59 (70.2)	84 (100.0)

stated opinions on the graduates' deficiencies. The answers were precoded into a three-level preference scale, so as to offer more flexibility for the interviewed supervisor.

The information summarized in Table 20 indicates that most of the supervisors believe that the graduate working in his enterprise will be upgraded once he has completed a certain number of years in his present occupation. But also one-fifth of them think that the graduate should have a better grasp of the theoretical knowledge related to the trade of the worker. This suggests that the present curriculum of apprenticeship courses should be reinforced in terms of the theoretical knowledge provided, since the workshop practices can be supplemented by the practical work in enterprises.

4.2. Comparative Analysis of Apprenticeship and Vocational School Preparation of Industrial Skilled Manpower

According to the general analytical framework used in this study, the relative advantage of a training scheme can be judged in terms of an analysis of its basic input and output elements. Graph 1 presents an entire list of such elements. However, for the purposes of the present analysis, the socio-economic characteristics and costs per graduate will be chosen as the basic inputs, and earning increases caused by training as the basic output of the system. Therefore, it is argued that once these three basic elements of both apprenticeship and vocational schools

systems are specified, the planner will be in a better position to make recommendations on total enrollment for each system.

In the previous analyses of regression, not all differences in earnings are explained by the educational background and job experience variables. In addition to education and experience, we know that factors such as family socio-economic background and personality variables influence the average income of individuals. If we could assume, however, that such factors would be randomly distributed between the sub-groups of workers being examined, the final effect of different educational programs will be merely a larger confidence interval in our predictions about income level of graduates from each program. If such factors would be distributed according to some pattern that is positively associated with education, our imputations of benefits to different forms of education may be falsified. Therefore, before examining whether there exists an earning differential associated with each system of training, it is necessary to examine the student characteristics in each of them.

In the present analysis, it is assumed that the students' socio-economic background is positively associated with educational attainment. Hence, if students entering the apprenticeship program were coming from families with a higher socio-economic level than students entering vocational schools, then we must suspect that their higher income may relate more to their higher status than to the effects of the apprenticeship program. In order to elucidate this problem, the author analyzed data on family income of students attending general secondary education and vocational schools in all secondary schools located in the Metropolitan

GRAPH 1. GENERAL ANALYTICAL FRAMEWORK APPLIED TO THE ANALYSIS OF INACAP'S APPRENTICESHIP PROGRAM[1]

INPUTS

Individual with Certain Characteristics:

1. Age
2. Socio-economic background
3. Previous education
4. Previous job experience
5. Academic achievement
6. Motivation
7. Aptitude
8. Sex
9. Location (urban/rural)

Costs to Individual Being Trained:

1. Fees
2. Books and materials
3. Travel and other incidental expenditures
4. Opportunity cost of time spent on training
5. Deducted scholarships, stipends, salaries

Costs of Training:

1. Salaries of teachers
2. Salaries of administrative and maintenance personnel
3. Buildings and equipment
4. Materials
5. Room and board
6. Scholarships
7. Incidental expenses
8. Minus fees, other charges, and revenue from sale of finished products
9. Marginal and average costs
10. Other

PROCESS

VOCATIONAL TRAINING PROCESS

OUTPUTS

Benefits to the Individual:

1. Monetary:
   a. Probability of getting first job
   b. Time lapsed between graduation and first job
   c. Progression of after-tax earnings
   d. Employment stability
   e. Lower accident rate
2. Intangible:
   a. Job satisfaction
   b. Gratification from more education
   c. Increase of occupational options
   d. Other (social and political participation

Benefits to Society:

1. Increased earnings (a proxy for increased productivity)
2. External benefits of general education
3. Proportion of time gainfully employed

Benefits to the Enterprise:

1. Less supervisory burden, more disciplined work force
2. Lower rate of turnover
3. Better socialization of workers
4. Increased productivity due to training (rather than new equipment)
5. Lower rate of accidents
6. Other (better ability to work as a team)

[1]Adapted from M. Zymelman, The Economic Evaluation of Vocational Training, John Hopkins University Press, Baltimore, 1976.

area of Santiago. The data collection was possible thanks to a survey conducted in 1977 by the Ministry of Education that aimed at assessing the capacity of each student's family for paying higher school fees. According to the rules set up by the Ministry of Education, those families which had an overall income of less than 5,600 Chilean pesos a month had to pay the minimum fees. But those which had more than that amount of income had to pay differential (higher) fees per student. Although this regulation had not come into practice at that time, it was considered useful to quote this classification of family income for students from both branches of secondary education, in order to compare them with the average income of families of the young people attending an industrial apprenticeship program. Data for the last item came from a survey by this author on the apprenticeship graduates' family socio-economic background.

TABLE 21

FAMILY INCOME OF GENERAL SECONDARY STUDENTS, VOCATIONAL SCHOOLS STUDENTS, AND APPRENTICES IN SANTIAGO (In Chilean Pesos 1977) [1]

Group of Students	5,600 pesos a month or less	More than 5,600 pesos a month	Total
General Secondary Schools	36,138 (54%)	30,479 (46%)	(100%)
Vocational Schools	24,426 (78%)	7,050 (22%)	(100%)
Apprentices' Sample	334 (95%)	19 (5%)	(100%)

[1] Source: Unpublished data collected by Area de Planificacion de la Secretaria Ministerial Area Metropolitana, for the first two categories, and the author's own survey for apprentices.

A comparison of the percentage distribution of each of the categories of education shown in Table 21 indicates that the general socio-economic background of students in general secondary education is higher than that of students attending vocational schools. It should be noted that this is consistent with results of studies carried out in other Latin American countries.[8] It appears that middle-class families have a tendency to send their children to general secondary schools rather than to vocational schools, since the latter prepare individuals for entering a manual job.

In addition, contrary to the situation observed by Jeffrey Puryear (1974) in Bogota, Table 21 suggests that in Santiago the socio-economic background of apprentices is generally lower than that of students attending secondary schools. Therefore, we conclude that the higher earnings obtained by apprenticeship graduates are not necessarily associated with a higher socio-economic status (SES) of their families. However, data on co-workers' SES was tested on the basis of SES of students attending secondary schools and not on the basis of a questionnaire administered directly to co-workers. Thus, the conclusions about co-workers' SES are based on rather indirect testing.

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[8] See Claudio do Moura Castro and Alberto de Mello e Souza, Mao-de-Obra Industrial no Brasil, Rio de Janeiro, IPEA/INPES, 1974, p. 257.

4.3. Rates of Return for Apprenticeship and Vocational School Preparation of Industrial Skilled Workers

We have thus ruled out the possibility that higher earnings obtained by industrial workers who finished an apprenticeship course is due to their higher socio-economic background, or the apprentices' characteristics associated with it. We now turn to the determination of the cost per graduate for vocational schools, which is the second important input described before. Once costs and benefits of vocational school programs are specified, it is easy to proceed to the calculations of their rate of return, and to compare the rate of return thus obtained to the one calculated for the apprenticeship program.

In order to obtain reliable data on the costs of vocation school training, a survey of vocational school costs per graduate was carried out by the author in eight schools of different municipalities of Metro Santiago. (The methodology and results of the survey are shown in Appendix II of the author's doctoral thesis.)

The comparison of rate of return for apprenticeship and vocational schools, however, may be objected to in terms of the different formal objectives that each program has. For instance, it may be argued that apprenticeship's main objective is to train skilled workers, whereas industrial vocational schools are supposed to train middle-level technicians for supervisory positions. Nonetheless, our data show that there is a higher proportion of apprenticeship graduates than vocational school

graduates in supervisory positions. This is why we are led to disregard the formal objectives of each program and to compare them on the basis of their actual results.

Since the average cost per graduate is about US$2,000 for vocational schools, this amount is taken as the institutional cost of the program. As was calculated for apprenticeship graduates, the indirect social cost is represented by the income forgone, and tuition fees are disregarded because they are rather symbolic in comparison to the program's institutional cost. Income forgone is then calculated for the length of the program and adjusted by the probability of employment. Thus, the income forgone amounts to about US$400, while the total investment in training a vocational school graduate is nearly US$2,400.

Advantages associated with attending a vocational school program are calculated on the basis of earning differences for industrial workers who attended an industrial vocational school, and those for workers who only finished primary schooling. On the basis of the results of the regression equation used in the author's original study and detailed in his doctoral thesis, the following table on income differences was prepared.

Table 22 indicates that the yearly income difference between elementary school graduates and vocational school graduates was 10,822.92 Chilean pesos by the end of November 1977. If this amount is divided by a rate of exchange (as of November 10, 1977) of 25.6 pesos per dollar, we obtain a yearly return of US$422.77. Since it was assumed that the effect of training lasts for ten years when calculating rates of return

TABLE 22

MONTHLY AND YEARLY INCOME DIFFERENCES FOR INDUSTRIAL VOCATIONAL SCHOOL GRADUATES AND CO-WORKERS WITH ELEMENTARY EDUCATION
(In Chilean Pesos, November 1977)

Years of Job Experience	Elementary Education		Vocational School Education		Yearly Difference (D - B)
	(A) Monthly	(B) Yearly	(C) Monthly	(D) Yearly	
1	1,376.98	16,523.76	2,278.89	27,346.68	10,822.92
2	1,563.21	18,758.52	2,465.12	29,581.44	10,822.92
3	1,749.44	20,993.28	2,651.35	31,876.20	10,822.92
.					
.					
.					
10	3,053.05	36,636.60	3,954.96	47,459.52	10,822.92

for the INACAP program, the same assumption will be maintained here. Internal, social, and private rates of returns were calculated using the following formula:

$$t = \sum_{1}^{N} \frac{B_t - C_t}{(1 + r)^t} = 0$$

where:

B_t = difference between earnings of individuals with training in a vocational school and individuals without training, in year (t), with zero value for the first four years of training.

C_t = costs of the vocational school program in year (t), which only applies to the first four years of training.

N = number of periods under consideration (in this case, four years of investment and ten years of benefits).

r = rate of return to vocational schools training.

Table 23 summarizes the results for the two different types of rates of return calculated for the average program[9] of industrial vocational schools, without adjusting them for the probability of employment since the exact rate of unemployment is not known for these graduates.

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[9] These rates of return represent an average for graduates from different trades. Some trades, however, may yield a higher or lower rate of return.

TABLE 23

RATES OF RETURN TO GENERAL AND TECHNICAL EDUCATION: CHILE, 1959 AND 1977; COLOMBIA, 1961; MEXICO, 1963; AND VENEZUELA, 1957 (PERCENT)[1]

Country & Type of Education		Private	Social
Chile (1977):	Industrial Vocational ed.[a]	73.56	7.42
Chile (1959):	General Secondary ed.[b]	-	17.00
Colombia (1961):	Technical Secondary ed.[c]	19.00	-
	General Secondary ed.[c]	30.00	-
Mexico (1963):	General & Technical ed.[d]	17.40	14.20
Venezuela (1957):	General & Technical ed.[e]	-	17.00

[1]Sources: (a) The author's own survey; (b) Arnold C. Harberger and Marcelo Selowsky, "Key Factors in the Economic Growth of Chile," quoted by Carnoy (1967:369); (c) Guillermo Franco Camacho, Rendimiento de la Inversion en Educacion en Colombia, Bogota, CEDE, July 1964; (d) M. Carnoy (1967); (e) Carl Shoup, The Fiscal System of Venezuela, Baltimore: Johns Hopkins Press, 1959.

To the extent that the rate of return is an appropriate tool to compare the two training programs under examination, and bearing in mind that both costs and returns of each program are approximate, it can be concluded from an analysis of Table 23 and Table 27 (page 90) that the apprenticeship program yields higher private and social rates of return than the industrial vocational school programs.

Also, Table 23 provides the results of the author's calculations on industrial vocational education rates of return, in comparison to results provided by similar studies on general and technical education in four Latin American countries. Although the private rate of return to the Chilean industrial schools appears to be rather high, the social rate of return is definitely lower than what was found in Mexico and Venezuela for general and technical education. The reason why private rates of return to the Chilean industrial schools appears so high is due to the fact that, in this study, private investment was reduced to the students' income forgone.

Finally, as will be pointed out in Section V, the rate-of-return approach applied to the analysis of competing educational programs may suggest a direction of change, but it cannot determine the magnitude of such change. Thus, the foregoing analysis would lead the author to recommend an increase in the overall size of the apprenticeship program, up to the point where the rates of return for both apprenticeship and vocational schools programs equalize. However, given the high proportion of graduates found unemployed, one would be tempted to consider a reduction in the size of the programs. But this would imply the elimination of one of the few competitive educational alternatives available to those children who cannot afford a secondary education.

V. AN ECONOMIC EVALUATION OF THE INACAP APPRENTICESHIP PROGRAM

5.1. The Rate-of-Return Approach to Educational Planning

Section V details an attempt to evaluate the INACAP apprenticesnip program from an economic perspective. In the previous sections, it was shown that this program is actually serving the young who come from the more disadvantaged groups of the population. Thus, here the intention is to find out at what cost it is working and what are its more evident economic results.

Any evaluation of an educational program presupposes a previous decision on a specific criterion to judge the degree of success of such a program. Unfortunately, at present, educational planners do not have a theory which can help them in determining a criterion that is acceptable to all individuals affected by the educational process. There are, however, some analytical propositions related to one approach or another which can be more or less useful depending on the specific type of analysis carried out, i.e., the manpower approach or the rates-of-return approach.

Choosing criteria to evaluate the degree of success of an educational program is directly related to the decision process which leads to the choice of one program instead of another. Normally, the preparation of a set of recommendations implies both the ability to test for internal consistency within the set of decisions, and consideration of alternative decision sets. Therefore, comparisons may be made between alternatives which

involve only small marginal shifts in numbers attending a specific type of school; or decisions might involve large proportionate increases in the educational system. It is argued that the use of the rate of return in the first case may be quite helpful, since decisions may entail gradual changes only and help to guide subsequent decisions at the new margins.

Nonetheless, before examining some of the main criticisms which have been addressed to the rate-of-return approach to educational planning, it appears useful to make explicit what is understood here by planning. Dror (1963: 51-52) defines planning from the perspective of administrative sciences as "the process of preparing a set of decisions for action in the future directed at achieving goals, by optimal means." While in general terms this author would suscribe to that definition, it is necessary to point out that none of the alternatives to a particular problem can be truly "optimal." In fact, the planning process, which consists of seeking for the best alternative that can be identified with reasonable time and effort in search and comparison, only attempts to find the best alternative on the basis of previously defined criteria. The planner, however, has no authority whatsoever to impose a criterion or to approve and execute the prepared plan. These decisions and actions are normally linked to the value system and political commitment of the actors involved. Therefore, the best soltuion to a problem will never be the best in any absolute, truly optimal sense. Moreover, in practice, the planner's recommendations will come closer to the notion of "satisfying" than to any optimal solution.[10]

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[10]For a good discussion of the topic, see C. A. Anderson and M. J. Bowman, "Theoretical Considerations in Educational Planning," in M. Blaug (ed.), Economics of Educations, Vol. 1, Penguin Books, 1971, p. 351ff.

Furthermore, the rate-of-return approach as well as the manpower-planning approach essentially views education as an investment in human resources. While there are reasons to question this assumption[11] under certain circumstances, it is also true that the rate-of-return approach helps in assessing how to compare the relative advantages of one particular educational program to another. Other factors being held constant, whichever program yields the higher rate of return should be chosen.

While many of the shortcomings of the rate-of-return approach are common to the manpower-planning approach, the former has an advantage in providing a guide for planning the allocation of resources to one educational program or another. The main shortcoming of both approaches is that they ignore the non-economic benefits of education; both include only direct economic costs and returns. As is well known, the determination of both cost and return in education is a very difficult task and rarely (if ever) accomplished with any great degree of success. However, if it is assumed that estimates of rate of return at a particular time at the best can no more than suggest a direction, not the degree or magnitude of change, we will be closer to the exact potential of this tool in educational planning. It is, therefore, argued that this approach can be considered a suitable instrument when dealing with fine decision margins -- even though liable to distortion when dealing with bigger decisions concerning investment in the entire educational system of a country.

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[11] This topic is discussed in the author's doctoral thesis, Chapter I, Section 1.3, "Analytical Framework," to which the interested reader is referred.

Social and private rate of return can be calculated when data on the institutional and family costs of education are available. Private rate of return deals with expenditures by students and their families, aside from tuition. The social rate of return, however, is that for the total pecuniary costs of schooling (or training), i.e., private costs plus institutional expenditure, both private and public. Therefore, a high private rate of return yielded by a particular educational program may not be attractive to society, if the program has a low social rate of return. To understand individual and institutional decisions, it is necessary to examine the estimates for a program which considers both private and social rates of return.

5.2. Observed Costs of the Apprenticeship Program

As has been pointed out, the rate-of-return approach is based on estimates of the monetary costs involved in an educational program and the observable economic benefits which it produces. The author is aware of the difficulties involved in costing out any educational program, and could well argue that a precise determination of educational costs is virtually impossible. However, when a decision should be taken on whether to develop one system of skilled-worker training (apprenticeship) or another (vocational schools), an estimate of the costs and benefits involved in each case is almost inevitable.

The cost of an educational program may be defined as the monetary value of all types of resources necessary for the learning process. Basically, this includes: (a) direct institutional costs, such as teacher salaries, building and equipment rents, as well as materials used during the process and various kinds of services provided to the students; and (b) indirect costs, such as the expenses covered by the students and their families (aside from tuition), as well as the students' income forgone.

In this part of Section V, an attempt is made to estimate the direct and indirect costs of the INACAP apprenticeship program, on the basis of information provided to the author by the INACAP Department of Research and Planning. A series of calculations was done by INACAP's personnel on the basis of existing data on expenditures of the Metro Santiago Apprenticeship Program since its inception in 1967 to December 31, 1977. During that period, 1,524 apprentices enrolled in the program, of which only 1,090 (72%) graduated.

INACAP's accounting system made it possible to study separately the expenditures and the overall number of hours of instruction employed for (a) related theory teaching, and (b) apprenticeship laboratory work at INACAP's workshops and laboratories.

In order to estimate the average cost per participant (and per graduate), and to avoid the distortion caused by the extremely high rates of inflation in Chile during the period under consideration, the Chilean pesos were transformed into their equivalent in American dollars of the year for which the calculation was being made. Therefore, utilization of these figures is subject to the following reservations: (1) the variations that

occurred to the American dollar during the period under consideration (1967-1977); (2) no precise information was provided about the way INACAP calculated physical capital amortization (depreciation) each year; (3) there was no information available on the rate of utilization of buildings and equipment and its implicit influence on the costs of the apprenticeship program during that period. And, finally, apart from the costs of INACAP's supervision of apprentices doing their practical work within enterprise workshops, there was no estimate of the costs involved during such periods of training. It must therefore be assumed that the enterprises involved balanced their costs with the production output of the apprentice.

With regard to indirect costs, it should be pointed out that the apprentices spend at least one-quarter of their period of instruction working in enterprise workshops, and that they receive a pay equivalent to 60% of the minimal wage during this period. In addition, unemployment rates for this particular age group run up to 32% in Santiago.[12] Therefore, income forgone by apprentices is reduced proportionately.

That is, the income given up during a three-year apprenticeship course would seem to be equivalent to 840 Chilean pesos (representing 60% of a minimal monthly wage in November 1977) multiplied by 36 (the course duration in months), to obtain an initial total of 30,240 Chilean pesos.

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[12] See III. MAJOR RESEARCH FINDINGS, Section 3.2.2, p. 41.

TABLE 24

TOTAL AND AVERAGE COST PER TRAINEE AND GRADUATE OF THE INACAP APPRENTICESHIP PROGRAM (In US Dollars)[1]

Trade	Expenditures per student				Expenditure per graduate		
	Total Costs	Theory Instr.	Labor-atory	Total	Theory Instr.	Labor-atory	Total
Industrial Mechanics	829,920	513.00	524.40	1,037.40	750.27	766.95	1,517.22
Automotive Mechanics	226,613	500.26	511.40	1,011.66	663.07	677.83	1,340.90
Automotive Electricity	56,784	438.75	448.50	887.25	540.00	552.00	1,092.00
Electromechanics	237,510	489.38	500.25	989.63	634.36	648.97	1,283.83
Metal Construction	31,886	492.75	503.69	996.44	685.56	700.74	1,386.30
Industrial Tayloring	66,394	513.00	524.40	1,037.40	800.78	818.58	1,619.36
Foundry & Moulding	99,590	746.18	762.13	1,508.31	1,145.30	1,170.74	2,316.04
Air Conditioning	27,191	611.18	624.77	1,235.95	672.30	687.30	1,359.60
Drafting	13,541	558.00	570.41	1,128.41	669.60	684.50	1,354.10
TOTAL	1,589,429						

[1]Source: INACAP's Department of Research and Planning.

However, the following deductions should be made: (a) since the apprentices work for an enterprise for at least 50% of their training period,[13] one should consider only 18 months of income to be forgone, or 15,120 pesos (840 x 18); (b) from the 15,120 pesos, one should then deduct an amount equal to 31.4% of it, or 4,838 pesos, the percentage corresponding to the unemployment rate for the 15-19 age group.[14] The actual income forgone is thus about 10,282 Chilean pesos (15,120 less 4,838). Since the rate of exchange by November 10, 1977 was 25.6 Chilean pesos per one American dollar, income forgone thus calculated is equivalent to approximately US$ 401.63.

Table 24 shows the average estimated direct social cost per participant and per graduate from each of the trades taught at the INACAP apprenticeship program. Since there are some variations in course duration and costs from trade to trade, it was decided to use the average cost per trainee when evaluating the cost of the overall program. Therefore, the total cost of the program (see Table 24) has been divided by the number of graduates (see Table 25), the result being US$ 1,042.93 and US$ 1,458.19, respectively. For the purposes of calculating the rates of return of the program, it will be assumed that the 28% of the apprentices who drop out of the program before graduation represent a cost but do not benefit from the program.

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[13] Apprentices in Chile now spend approximately 50% of their time in the training center and 50% in plants and enterprises. See I. INTRODUCTION, Section 1.1, p. 6.

[14] See p. 41.

TABLE 25

ENROLLMENT, GRADUATES, AND INSTRUCTION HOURS PER TRADE OF THE METRO SANTIAGO INACAP APPRENTICESHIP PROGRAM (Up to December 1977)[1]

Trade	Enrollment	Graduates	Groups	Hours of Instruction		
				Theory	Laboratory	Total
Industrial Mechanics	800	545	50	91,200	60,800	152,000
Automotive Mechanics	224	169	16	24,902	16,602	41,504
Automotive Electricity	64	52	4	6,240	4,160	10,400
Electromechanics	240	185	15	26,100	17,400	43,500
Metal Construction	32	23	2	3,504	2,336	5,840
Industrial Tayloring	64	41	4	7,296	4,864	12,160
Foundry & Moulding	66	43	6	10,944	7,296	18,240
Air Conditioning	22	20	2	2,988	1,992	4,980
Drafting	12	10	1	1,488	992	2,480
TOTAL	1,524	1,090	100	174,662	116,442	291,104

[1]Source: INACAP's Department of Research and Planning

As stated above, from the total of column one of the two previous tables, it is established that the direct social cost per graduate of the apprenticeship program was US$ 1,458.19. Total social cost, however, included this amount and US$ 401.63 of income forgone.[15] Family expenses were disregarded because they would have occurred even if the student had not attended the apprenticeship program. Tuition fees were negligible during the period 1967-1977. Thus, the final cost per graduate is estimated, in US currency, to be $1,859.82.

5.3. Observed Benefits of the Apprenticeship Program

The measurement of any educational program's effects requires knowledge about the treatment group and a group fully comparable except for the fact that it has not been submitted to the treatment. Normally, the finding of such a fully comparable group is a major problem. Most evaluations of training rely either on qualified, interested non-trainees or persons representative of the target population. In either case, there are usually systematic between-group differences that affect the variable of concern to evaluation, and statistical methods are employed to remove their effects, before the treatment effect is calculated (Hardin, 1973).

Thus, the choice of a control group is crucial in determining the actual benefits of an apprenticeship program. Jeffrey Puryear (1974), for instance, decided to use a random sample of Bogota males between the ages of 20 and 29, who had completed at least primary school, but no more

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[15] For the purposes of this study, income forgone is equalized to output forgone.

than secondary school, to match a sample of graduates of the SENA (Colombian National Apprenticeship Service) program in Bogota. Apart from being expensive, this method of sampling does not necessarily guarantee to remove all between-group differences, because individuals participating in the program are normally not chosen at random.

In the present study, the author decided to match the INACAP graduates to a sample of their co-workers who had a similar job experience and age, but differed in the kind of training they had received. Thus, by comparing the graduates to their co-workers, it was expected to remove part of the distortion introduced by different patterns in labor reward and in career development which may exist in different enterprises. Furthermore, to compare the INACAP graduates' monthly wages, a sub-sample was chosen according to the following: (a) age: only individuals between 18 and 30 were chosen; (b) years of professional experience: they had to have less than ten years of experience to match the characteristics of the trainees; and (c) years of schooling: they had to have completed between 6 and 8 years of schooling, previously, to start working. These were the minimal conditions that were thought necessary to match the INACAP graduates' sample characteristics.[16] Once the characteristics of the control group were determined, the profile of monthly wages by years of professional experience was calculated for both groups (see Table 26). (In this study the words "earnings" and "income" are used interchangeably; both refer to income from Labor only.) It is therefore assumed that the higher monthly

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[16]The sampling procedure is fully explained in the author's doctoral thesis, CHAPTER I, Section 1.3.3, to which the interested reader is referred.

wage of INACAP graduates is the effect of apprenticeship attendance. In addition, it is assumed that the effects of the program last for ten years. After that period, workers may need to be retrained.

However, it should be pointed out that given the rather small sample, several irregularities or inconsistencies in the monthly wage data showed up. Some individuals had relatively higher (or lower) wages than would normally be expected, considering their years of professional experience and training received. Therefore, it was decided to use the regression equation which best fitted the data for both groups (elementary education and INACAP apprenticeship). Both income profiles finish by the ninth or tenth year of work, thereby being shorter than life-income profiles normally used in calculations of rates of return to education. Nonetheless, it would be difficult to project them without making mistakes with regard to the actual impact of apprenticeship on earnings, after the tenth year of work. In order to avoid overestimating the actual impact of the program, it was decided that the differences in wages after the tenth year of work will be zero. In addition, as illustrated in Fig. 1, the regression equation assumed that earning differences during the first ten years of work are constant. Table 26 shows the calculations done to obtain the net benefit of the program.[17]

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[17] For detailed explanations on the use of the rate of return, see Mark Blaug, "The Rate of Return on Investment in Education," in M. Blaug (ed), Economics of Education, Vol. 1, Penguin Books, 1971; and John Vaizey, The Economics of Education, London, Macmillan, 1973.

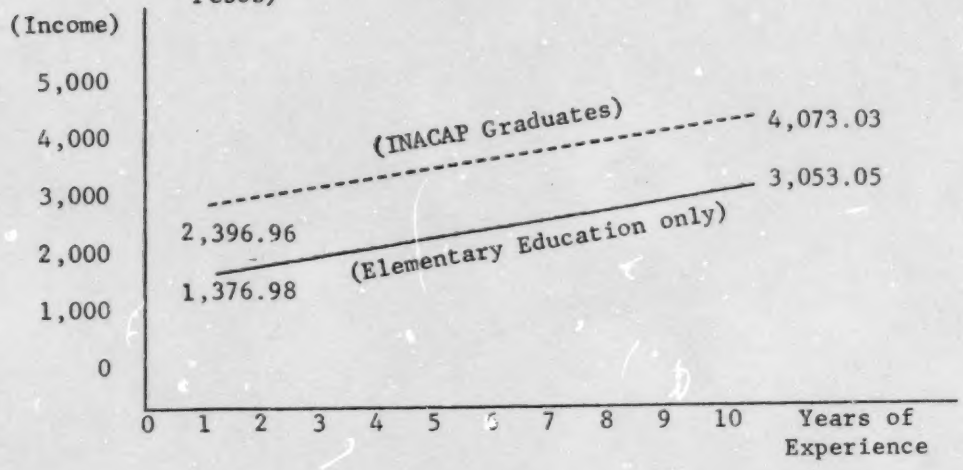
TABLE 26

MONTHLY AND YEARLY INCOME DIFFERENCES FOR INACAP GRADUATES AND CO-WORKERS WITH ELEMENTARY EDUCATION ONLY (In Chilean Pesos)[1]

Years of Experience	Co-Workers With Elem. Ed. Only		INACAP Graduates		Yearly Difference
	(A) Monthly	(B) Yearly	(C) Monthly	(D) Yearly	(D - B)
One	1,376.98	16,523.76	2,396.96	28,763.52	12,239.76
Two	1,563.21	18,758.52	2,583.19	30,998.28	12,239.76
Three	1,749.44	20,993.28	2,769.42	33,233.04	12,239.76
Four	1,935.67	23,228.04	2,955.65	35,467.80	12,239.76
Five	2,121.90	25,462.80	3,141.88	37,702.56	12,239.76
Six	2,308.13	27,697.56	3,328.11	39,937.32	12,239.76
Seven	2,494.36	29,932.32	3,514.34	42,172.08	12,239.76
Eight	2,680.59	32,167.08	3,700.57	44,406.84	12,239.76
Nine	2,866.82	34,401.84	3,886.80	46,641.60	12,239.76
Ten	3,053.05	36,636.60	4,073.03	48,876.36	12,239.76
TOTAL					122,397.60

[1]Source: Calculations done by the author from the regression equation (4) shown in Table 34 of his doctoral thesis. (See Oscar E. Corvalán-Vásquez, "Comparative Study of Industrial Training in Chile," Unpublished Ph.D. Thesis, University of Toronto, 1979, pp. 145-146.)

Figure 1. Adjusted Income/Experience Profiles for INACAP Graduates and Co-workers with Elementary Education only (in Chilean Pesos)



5.4. Social and Private Rates of Return to INACAP Apprenticeship

The rate of return for a particular educational program is usually calculated on the basis of occupational earnings by age, adjusted by the probability of employment. Moreover, the soundness of using the present earnings of older individuals to represent future earnings of today's entrants to the labor market is questioned on the basis of two major arguments: (1) we do not know for certain whether a new graduate will be earning in X years as much as the present earnings of someone who graduated X years ago; and (2) the effect of training may increase as the new graduate gains more experience, but then the effect may decrease, as new technological advancement occurs. The worker may therefore need to be retrained.

With respect to the first criticism, Blaug (1971: 215-259) has shown that "the rate of return is not sensitive to the entire age-earning profiles of educated people; provided we can correctly project the next five or ten years' earnings, significant shifts in earnings patterns in three or four decades do not substantially affect the results." Furthermore, cross-section data used in calculations of present rates of return might be preferred over genuine life-cycle data in that they are free from the influence of the trade cycle and implicitly provide estimates in money of constant purchasing power.

As to the second argument, this study is assuming that the effect of training lasts for only ten years. After that, its effect is assumed to be nil, and no income differences are claimed. The graduates' earnings may increase during the first five years and possibly have a relative diminution during the second five years. But even so, these differences cancel themselves when a constant earnings difference during the ten years is assumed.

In addition, because of the effect that the long periods of unemployment may have on the average earnings of INACAP graduates, this analysis considers years-of-experience/income profiles instead of age/income profiles. The adjustment for a factor representing the probability of employment was done prior to calculating the final rates of return.

In this part of the study, three different types of rates of return are calculated. First, the internal or institutional rate of return of the apprenticeship program was calculated on the basis of considering INACAP

expenditures as the total cost, and the graduates' higher income as total benefit. Second, the private rate of return to the program was calculated. Third, the social rate of return, which includes institutional and private cost, was calculated. Furthermore, separate calculations were done adjusting for the probability of employment of the graduates. As was shown in Section III, only 70% of the graduates were found working. Thus, the higher earnings expected from the program must be adjusted by a factor representing the probability of employment of the graduate (.7).

The internal rate of return has been defined as the rate of interest which relates the present value of the net benefits expected from an investment with its present cost. The term "cost" here refers only to INACAP cost.

In mathematical terms, the rate of return is the rate of interest (r) which equalizes the present value of the net benefits from the program $\sum_{t=1}^{N} \frac{B_t}{(1+r)^1}$ and the present value of the costs $\sum_{t=1}^{N} \frac{C_t}{(1+r)^1}$;

That is to say $\sum_{t=1}^{N} \frac{B_t - C_t}{(1+r)^t} = 0$, where,

B_t = difference between earnings of individual with training and individual without training in year t (with zero value for the first three years of training).

C_t = costs of the apprenticeship program in year t (which only apply during the first three years of training).

N = number of periods under consideration (in this case, three years of investment and ten years of benefits).

r = rate of return.

Table 27 summarizes the result for the three different types of rates of return calculated for the apprenticeship program, with and without adjusting for the probability of employment.

Private rate of return has been defined as the rate of return to expenditures by students and their families. In contrast, the social rate of return includes both institutional (INACAP) and students' expenditures as costs. Both types of costs represent society's investment in training. However, since educational programs are usually higly subsidized, the private rate of return can heavily influence the social demand in education. Furthermore, assuming that the higher earnings of the graduates correspond to a reasonable expression of their higher productivity, it was assumed that the social benefits are equivalent to private benefits.

TABLE 27

RATES OF RETURN TO THE INACAP APPRENTICESHIP PROGRAM

	Without adjusting for unemployment	With a .70 factor of probability of employment
Internal Rate of Return	20.44	12.72
Private Rate of Return	91.90	73.58
Social Rate of Return	17.47	10.14

The results summarized in Table 27 deserve a series of comments. First, the internal rate of return calculated for the public investment made (through INACAP) in the apprenticeship program shows that public expenditures in this

item are yielding a rather high rate of benefit. In effect, the rate of return is about 22.96% when no adjustment is done for the proportion of graduates found unemployed or out of the work force. If this factor is considered, the 12.72% rate of return still appears to be lucrative enough for recommending that INACAP pursue its apprenticeship program.

Second, the private rate of return appears to be extremely high for students entering the apprenticeship program. As the program's tuition fees were negligible during the last ten years, the only important investment made by the students was loss of the probable income they would have had if they had sought employment instead of entering the apprenticeship program. Since the value of the estimated income forgone is rather low in comparison to the prospective earnings for graduates, a rate of return of 51.25% appears to be very attractive for students who decide to enroll in the program. This fact explains the need for INACAP to make a selection among the candidates to the program. Nonetheless, this selection has not yet biased the program in favor of the middle-class children.

Third, the social rates of return appear to be a more precise measure of the economic results yielded by the program because they include, under the cost item, both institutional and private investment in the program. It is necessary, however, to emphasize that the actual meaning of these figures should be weighted against the probability of employment for the graduates, for it is virtually impossible to expect all of them to obtain a job. Thus, the social rate of return decreases from 17.33% to 10.14% when this last factor is taken into consideration.

The evidence previously presented in this paper, about the rather low socio-economic family backgrounds of the apprentices in the sample, lead us to rule out the possibility of systematically over-estimating the positive effects of the personal characteristics of the trainees rather than the effect of the program. If a social rate of return of about 10% is considered a competitive investment to society, then the INACAP apprenticeship program should be encouraged to pursue its educational activities. In the event that there were some errors in the estimates of costs of the program, this would not significantly lower the reported rate of return. What is seriously affecting the profitability of the program is the high rate of unemployment observed among its graduates. An estimate of error would probably lead to the consideration of a higher cost for the program. However, recent changes introduced in the program in 1977 have permitted a reduction in costs. In effect, the National Service for Training and Employment (SENCE) is planning to subsidize the program at a considerably lower cost (about US $225 per student a year). This will certainly lead INACAP to raise the amount of tuition fees for the program, thus lowering the extremely high rates of private return.

5.5. Summary and Conclusions

Section V represents the typical type of study carried out when evaluating the performance of an educational program. It provides information on the functioning of the program, the characteristics of its basic input,

and some measure of the program's output. This information would be enough, if the investigator were only interested in providing suggestions for improving the program or indicating the degree of success or failure of the program per se, regardless of the success or failure of similar programs. Actually, despite the fact that most of the graduates recognize that the program's quality of teaching is quite good, there are some areas in which they hope to see improvement. They would particularly like to see better supervision of the practical work done in enterprises, a more complete curriculum for the related theory taught at INACAP, and better adjustment to the employment supply and demand in each trade.

VI. SUMMARY, CONCLUSIONS AND IMPLICATIONS FOR POLICY

This final section summarizes the main findings of the study and expresses some of the conclusions which can be drawn on the basis of the available data.

In judging the overall results of the present study, it is important to consider that it has focused on alternative paths followed by a sample of industrial workers to become skilled workers, on the basis of the examination of a very small group of occupations. Hence, this research does not provide an analysis of the best alternative available to students finishing primary schooling and aiming to pursue secondary education only. Such an analysis would have required the examination of a wider variety of occupations, probably on the basis of follow-up study of a random sample of graduates from different programs.

6.1. Economic Benefits and Occupational Flexibility

The aim of this study was to evaluate the results yielded by the INACAP apprenticeship program on the basis of a selected group of indicators. The results of the study suggest that, under certain conditions, it is possible to substitute an out-of-school program for formal secondary schooling and achieve similar economic benefits for the individual participants and for the society.

In terms of society's benefits from the apprenticeship program, there are three indicators which suggest that this program is yielding a satisfactory result to social investment. First, it has a high rate of return; second, it appears that the productivity of INACAP graduates is higher than that of graduates from other programs; and third, it can be assumed that if INACAP graduates receive higher earnings they must also pay higher taxes.

Comparison of the rates of return to the preparation of skilled workers in vocational schools and the apprenticeship program indicates that the latter presents a higher rate of return. Our study of costs of both systems shows, however, that yearly investment per student is slightly higher in the apprenticeship program than in vocational schools. This finding contradicts the widespread belief that non-formal education programs are cheaper than formal ones.

Another commonly held belief -- to which there is contradictory evidence in this study -- is the one related to the superior degree of adaptability to occupations of vocational school graduates. In fact, graduates from the apprenticeship program are as likely to be found in several occupations closely related or not particularly related to their trained-for trades. Since the ones working in a related field do not necessarily have very inferior wages than those working in their trained-for trades, it could be argued that this is a good indication of occupational flexibility provided by the apprenticeship program.

6.2. Job Opportunities and Social Mobility

Probably owing to its rather small size, it has been possible for the apprenticeship program to provide help in the placement of graduates. This has played an important role in ensuring that the majority of the graduates can get a job in their trained-for occupations, and, therefore, has ensured that they can apply what they have learned in the apprenticeship program.

This study has also shown that the apprenticeship program has promoted a process of social mobility among its graduates, by helping them to attain a skilled job and a higher status and income within industry. Actually, initial and subsequent levels of earnings of INACAP graduates are similar or higher than those which apply to graduates of vocational secondary schools. It should be recalled that most students who decided to enter an apprenticeship program were unable to pursue secondary education. It is also worth noting that nearly half of the apprentices' fathers were unskilled laborers, and that only about a quarter of them had non-manual jobs. In other words, while the INACAP graduates under examination belonged to a working-class family, by attending the apprenticeship program they had been able to cross the unskilled-skilled dividing line between workers.

Furthermore, the study has suggested that the average INACAP graduate is adequately prepared to work in enterprises of different sizes and organization. The results of the sample showed that 54% of the graduates actually work in enterprises of less than 50 workers. However, there is no conclusive evidence in the present study as to whether larger enterprises actually pay their workers higher salaries than do smaller

enterprises. The only evidence related to this point is that jobs/positions in bigger enterprises seem to offer better employment stability.

6.3. Indirect Effects of the Program

What has been pointed out represents an important set of indicators of the effects of the apprenticeship program. Nevertheless, it is necessary to consider that such positive results of the program may also be associated with non-cognitive factors such as, persistency, discipline, sense of organization, etc., which are all essential to building a professional career. It can be expected that these factors are probably better developed when the student is required to work nearly half of his training period in enterprise shops, rather than in school shops. But, it could also be reasonable to assume that the method of training used by INACAP, based on a systematic development of a training syllabus closely related to what is required from the apprentices on their jobs, must motivate them more to learn than would a school curriculum. In a school situation students are normally expected to learn a body of knowledge not readily applicable to their professional careers.

Nonetheless, from another standpoint, it might be possible that by passively integrating young workers to the hierarchical structure of the enterprise, these workers are led to accept the "political establishment" of their society. However, this is an area which was not explored in this study -- but the author readily acknowledges that a technical program, such as the one examined here, is not exempt from inculcating some kind of political ideology, as most educational programs do.

6.4. Implications for Policy

This study has provided some evaluation of the apprenticeship system in comparison to the preparation of skilled workers by vocational schools. It has been argued above that the apprenticeship system has a potential for training skilled workers, and also, that enrollment could possibly be increased up to a point at which the rate of return of both mentioned systems will equalize. Since there is some evidence that workshops and student stations available at INACAP training centers are not being used to a maximal degree of intensity (i.e., at least three shifts of students per day), an increase in apprenticeship enrollments would not necessarily imply higher capital investment. Therefore, a lower cost per student and per graduate could be expected if an adequate expansion of the program was carried out.

Furthermore, as was pointed out in the main body of this study, it is not possible to suggest an ideal size for the apprenticeship program. All that is suggested here are some areas in which the program should be improved, and an increase in its overall enrollment. The movement towards enrollment increase should stop as soon as the rate of return of the program falls to the level presented by similar programs.

To conclude, it should be said that the apprenticeship program has proved that it is possible to teach and enable children of the lower classes to attain a reasonable degree of success in their subsequent professional careers. But the program has also shown that is is preferable to teach a core set of technical subjects well rather than to teach a wide variety of subjects.

Since this is a small-scale study, it is obvious that its results should be treated with caution. Given the fact that the study is not based on a representative sample of the total population of workers with different training backgrounds, its results might not be valid beyond the group of firms studied. It could be argued, for example, that the firms recruit the least efficient of the industrial vocational school graduates and therefore the mean performance level is lower than what would be expected from an average industrial school graduate. A counter argument would be that this particular group of firms represents a group of high-prestige, modern firms which offer relatively good wages and fringe benefits, and also provide a reasonable job security that is highly valued in the present labor market conditions of the country.

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